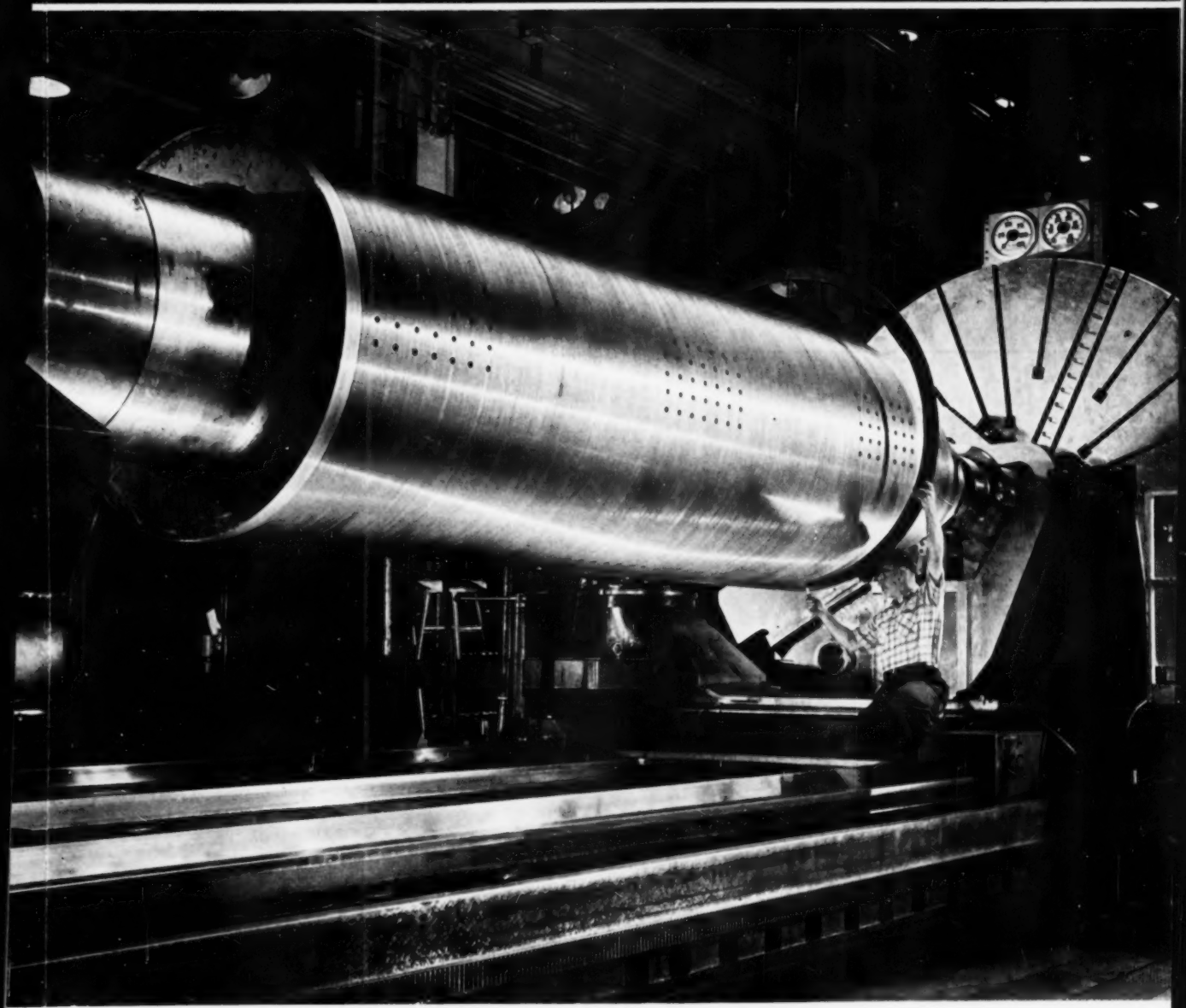
American Machinist

JUNE 15, 1959 75¢

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

EXPLOSIVE FORMING

Special Report, Page 127



Checking a generator rotor with a 6-foot "bow mike"—see page 2

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- **Flexible scheduling flattens seasonal peaks,** page 124

METALWORKING REPORT, page 2

Award-winning Model 090 Centri-Matic

GRINDS INNER RACES THIS SIZE

NEW HEALD DEVELOPMENT awarded Certificate of Excellence in 1958 MINIATURIZATION AWARD for unique, systems-engineered design

THIS AWARD, the first ever made to a machine tool manufacturer, cited the Model 090 for the following contributions to miniaturization.

"The Heald Model 090 Centerless Internal Grinding Machine is considered to be a radically new development, system-engineered specifically for improved production of miniature ball bearings. Whereas previous equipment had been modified to adapt it to miniature work, the Model 090 was completely designed for this purpose alone, with all components working at optimum efficiency. With this machine, inner races as small as .040" I.D. can be ground to .00015" size tolerance and 5 microinch finish in a fully automated 15-second cycle. Major advances in design include shoe-type centerless work-holding with rotation from both front and rear faces — specially-designed super-speed wheelheads — hydrostatic anti-friction feeding cross slide with ultra-sensitive electronic control — and sensitized method for automatically maintaining precise wheel-to-diamond relationship and compensating for drift."

Whether you grind miniature parts or not, this development is a significant example of Heald's ability to solve tough precision-finishing problems. Your Heald engineer will welcome *your* problems, too.

It PAYS to come to Heald

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THE HEALD MACHINE COMPANY

Subsidiary of The Cincinnati Milling Machine Co.
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McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

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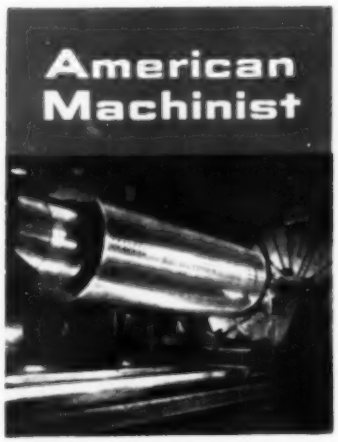
TURN PAGE FOR METALWORKING REPORT →

METALWORKING REPORT

SIGNIFICANT CURRENT DEVELOPMENTS IN TOOLING AND PRODUCTION PROCESSES



COVER:
Six-foot "bow" micrometer checks dimensions of a 90-ton generator rotor to be installed in Wisconsin Electric Power Co's Oak Creek power plant. The rotor is 33 ft long and 5 ft in diameter; and was machined on a 144-in. engine lathe, one of the largest in the country, installed at Allis-Chalmers Mfg Co, Milwaukee.

CUTTING

300,000 RPM

The Borden Airoter, a dental drill of relatively recent development that has excited the admiration of both dentists and patients because its speed (in excess of 300,000 rpm) keeps the tooth cool, has been adapted for industrial use. The compact tool supplied by the Ashcombe Co, York, Pa, is only $^{5}/_{8}$ in. in dia and $^{1}/_{2}$ in. long—though it has an adapter attached to make it large enough to hold a chuck conveniently.

Mounting carbide burs or diamond points, the tool is being used in lathes, milling machines, jig borers, and as a hand tool. The high speed not only keeps both tool and work relatively cool, but makes it possible to get reasonable surface speeds with very small burs or points.

The control unit supplies filtered air up to 2 cu ft per min at 40 psi and can operate from shop air lines at pressures of 40 to 125 psi. Tests with a ¼-in. plate of Type A4 air-hardening tool steel at 62 R_c hardness report 10 minutes to grind 0.011 in. from a 0.025 hole, 18 minutes to remove 0.028 in. from a 0.045 hole using a carbide bur. (A bulletin can be requested by circling No. 50 on the Readers Service Card.)

Positioning With Bars

Dimensions picked from a blueprint are set directly on easy-to-read counters and dials to accurately position, within ±0.0001 in., the table and spindle head of DeVlieg Jigmils, and other metal-cutting machine tools. Called "Diatrol," the system will position in plus or minus directions from a given datum point. It uses master measuring bars plus hollow-nub locating pins and dial-set dimensions are achieved by a differential transformer finding magnetic (non-contacting) center of nub.

FORMING

Avoids Shoulder Punches

Replacement of chipped or broken head-type punches in dies is a tedious and expensive maintenance operation. Any repairs must be made in the toolroom. Also when punches dull, the die must be pulled out of the press, separated, the stripper removed, and the punches sharpened. Several hours are consumed.

A quick-replaceable punch that requires no special tooling equipment has now been developed. The "Cone Lock" principle is used. The punch head is of the same OD as the body, but has a V-shaped circumferential groove. The punch retaining plate is counterbored with an angular surface at the bottom. Into the counterbore goes a 2-part retainer—a split ring and a washer-type spring.

To insert the punch, it is pushed into the hole in the punch-retaining plate, expanding the split ring and snapping into the locked position. To remove the punch, it is twisted and pulled downward. Yet, the "Cone Lock" punch resists high stripping pressures. Irregular punches can also be held. Pivot Punch & Die Corp, North Tonawanda, N Y, claims the punch will reduce die manufacturing costs up to 20%, as well as reducing press downtime for maintenance.

Bang Parts to Shape

Exploding forming is now being put into production at North American Aviation on shells and sheets, where its particular advantages can be applied. In one case, a loop of Primacord is tied around a shell to swage the shell into a groove cut in an internal plug. After considerable research and experiment, fabricating shops have found that explosives are safe (RDX can be pounded, cut, and crushed without danger) and versatile, as well as capable of moving large sections of metal almost instantly into complex contours. They are also predictable—exact forming forces can be calculated from known constants and weight measurements of the explosives. See special report, p127.

CAUTION

These pages are not a synopsis of this issue of American Machinist. Major articles are described briefly in the Contents page. Because the Trends pages are classified by subject, they are not described anywhere else. Most of the developments in this department are so new that further information is not yet available —when it is, you will find a page reference to the article.

HEAT TREATING

Luminous Infrared Furnaces

Luminous walls develop temperatures from 300 to 2600 F to melt aluminum and heat-treat superalloys. Technique developed by A F Holden Co, Detroit, burns gas to create infrared radiation that can be applied to space-vehicle materials. Process is highly versatile; will handle low-temperature and high-temperature operations.

INSPECTION

Wide-Range Precision Mike

Most small hand micrometers have a relatively small measuring capacity, and only some vernier models read to tenths. Now a Canadian company is preparing to market a device with capacity of 0-4.1 in. for OD measurements, 0.5 to 4.6 in. for ID dimensions. Accuracy is said to be ±0.00002 in. throughout the entire range, at a price of $110. More accurate models are available but they are more expensive.

The micrometer's anvil is made of hollow square tubing, in which positioning holes are drilled at ½-in. intervals. The preloaded spindle is actuated by a worm gear, and constant torque assures a uniform turning movement in both directions (for OD or ID measurements). Graduations on the spindle barrel and a thimble dial are used to measure to the accuracy claimed. Indur Co., Ltd of 74 Villa Crescent, Ottawa, is preparing to market the micrometer.

WELDING

Zinc-Soldered Aluminum

Sound, corrosion-resistant soldered joints in aluminum are best made by the zinc-soldering method, according to a report issued by Alcoa after exhaustive tests of the technique. It also makes superior joints between aluminum and other metals and is even better than brazing in certain applications.

The fluxes are less expensive than brazing fluxes and are simpler to remove after soldering. And, with zinc soldering, aluminum can be joined to copper, because the method operates at lower temperatures than brazing does.

It's not a new technique, but Alcoa says it hasn't been appreciated because it can't be completely successful without proper procedures, solders, and fluxes. However, the company claims the process is especially suited to bonding thin, complex sections, including heat exchangers of all types, and predicts increasing application in the refrigeration, automotive, and electrical industries.

More Spots; Same Power Supply

When a number of spotwelders are tied into the same power supply and all of them fire at once, the resulting voltage drop can easily be severe enough to cause bad welds. One way to avoid this difficulty is to have a large enough power source—or enough power sources to handle any peak load.

A better and less expensive way, according to Instrument Control Co of Minneapolis, is to employ a master welding control that prevents the overlapping of firing times and thereby eliminates voltage drops.

The company has just installed a control to program the operation of a group of 25 large press welders, each of which contains as many as 50 welding guns. Electronically operated, it monitors all 25 presses in a scanning time of a few thousandths of a second.

But the company also claims that a sequencing interlock can be installed economically in shops with as few as five single resistance welders.

THE OUTLOOK

Production of metal goods of all kinds will be much bigger this year than last, steel strike or no steel strike. Industrial machinery orders are up sharply. Autos, appliances, farm implements and bearings are chalking up sharp gains over 1958.

ASSEMBLY

Gas is Structural Member

Assembly details just released on the Convair Atlas missile indicate that the main fuel tank is built something like a football—no internal structure. The tough skin is a special cold-rolled austenitic steel (AISI 301) thinner than a dime, but meeting a minimum tensile strength of 200,000 psi. The tank holds petroleum and LOX propellants, which by weight keep the tank sides bulged to full diameter when the missile is fueled. As the fuel is used up, helium under pressure fills the growing cavity to keep the tank walls out to shape—and to force the fuel to the Atlas engines. Steel sheets are butt spotwelded and reinforced with a band of stainless to form rings. The rings are joined by lap spotwelds. Three domed bulkheads close the ends and keep the two fuel elements separated. Complete tank is 60 ft long, 10 ft in diameter. Walls are also the outside walls of the missile from the propulsion section to the nose cone.

Higher-Strength Fasteners

Strongest threaded connectors to date are 260,000-psi bolts and self-locking nuts announced by Standard Pressed Steel Co at the Design Engineering Show, Philadelphia. They are primarily aircraft and missile fasteners, with thread rolled after heat treatment to R_c 51. Material is 5% chromium steel of Vascojet 1000 type. Cadmium plate is vacuum-deposited to eliminate hydrogen embrittlement.

Nuts and bolts are 12-point types, and have large, controlled root radii about 30% greater than for normal threads, but the bolts will assemble with normal nuts and tapped holes. Minimum tensile strength is 260,000 psi, yield is 215,000, and shear is 156,000 psi.

FINISHING

Double Nickel Protects Die Castings

Designed primarily for outdoor protection of automotive zinc die castings, a new plating process has been developed by Doehler-Jarvis Div, National Lead Co, Toledo, Ohio. In place of the conventional single coat of copper-nickel-chromium, two coats of nickel are applied under the chrome. The first coat is semi-bright and represents 60 to 75% of the total thickness. It is produced from a sulfur-free bath and develops a columnar structure that is, in itself, much more resistant to corrosion than the laminar structure of the second, bright layer that serves to provide the decorative finish. An extensive test program with neutral and acetic acid salt sprays, as well as by exposure to the Detroit atmosphere, has shown that the double plate improves corrosion resistance by 25 to 33%.

Electroformed Sieves

Ultrafine sieves with openings as small as 0.0008 in. and with complete uniformity are being produced by Buckbee Mears Co, St Paul, Minn, for measuring particle size of a cracking catalyst. Sieves are produced in sets with openings ranging from 90 to 20 microns by nickel electroforming.

To make the fine mesh, a glass plate is etched to the required size and contact printed on a nickel-clad copper plate coated with photo-sensitive enamel. During development, the enamel is removed from the un-

exposed areas. The matrix is then placed in a nickel plating tank until about 0.0001 in. of nickel has been built up. This cobwebby structure is then stripped from the baseplate and placed on a fine copper supporting grid. The two are then placed in another nickel plating bath. The nickel is strong enough to resist abrasion from the catalyst and is, of course, highly resistant to corrosion. Furthermore, it protects the purity of the catalyst, an important feature in this application.

MATERIALS HANDLING

Conveyorized Forging

Automatic operation has gone a step farther at GM's Saginaw Steering Gear Div, where forging operations have been speeded by a system of conveyors and handlers that move the steel from press to press down four forge lines.

Starting in the stores area, steel bars are automatically fed into presses that cut them into billets. The billets fall into a bucket conveyor that carries them individually to the induction heaters.

Most of the forging presses are fed manually because it's not practical to duplicate this operation mechanically, but normally, a conveyor delivers pre-positioned parts to the operator.

Then, another conveyor catches the finished forgings as they drop through the trim press and takes them to a furnace, sorting the trimmed flash from the forged parts on the way. Finally, the parts are carried through the furnace by another conveyor. More details on p 139.

MATERIALS & COMPONENTS

Laminate Super-Strength Steel

Cylinders fabricated of strip-wound paper-thin steel offer a static tension ultimate stress of 305,000 psi for rocket engines, according to Ryan Aeronautical research engineers. The material was developed by Ryan in research on a secret project calling for enormous internal pressures. It seems to have established the value of a technique tried for cannon barrels during World War One—winding the barrel as a coil spring and then joining the coils by welding.

Ryan's experimental work has demonstrated the possibility of attaining the high strength by wrapping extremely thin (0.008 in. thick) steel strip on a mandrel. To attain the cylinder wall's ultimate thickness, several layers of these thin steel sheets are wrapped on the mandrel, tackwelded as they are applied, and then resistance welded through all of the layers.

Modification of spotwelding techniques has helped to raise the limit of the material's usable strength, and heat treating afterward further improves the properties of the wrapped structure.

It is believed that the technique of wrapping thin sheets or strip may simplify the use of the new high-strength alloys. Many of the materials being developed for 250,000+ psi strength acquire brittleness with their strength. Wrapping may minimize this problem. However, it won't be simple to reduce some of these alloys to paper-thin strip.

MANUFACTURING CONTROL

Exceeds Contract Requirements

Army Signal Corps has a plan under which contractors can gain special recognition for delivery of a high-quality product. Called RIQAP (Reduced Inspection Quality Assurance Plan), the program calls for maximum use of the contractor's quality control and inspection systems, and minimum inspection by the Army Signal Corps.

To win this recognition, the contractor's quality control and inspection procedures are reviewed by a Signal Corps technical group. This is done if the plant consistently has produced to a quality that equals or exceeds the quality levels set by contract.

Example: Packard Bell Electronics Corp, Los Angeles, was recently certified as a RIQAP contractor for production of the TPA-3 ground decoder unit. Brig General Elmer J Littell, commanding the Signal Corps Supply Agency at Philadelphia, said ". . . The completeness of the manufacturing process and quality controls, the supporting records, and the quality of the end product . . . work to our mutual benefit in reducing costs and improving our relationships."

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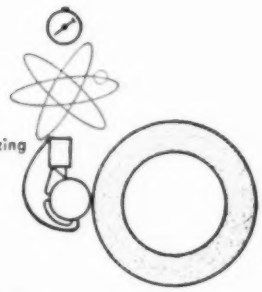
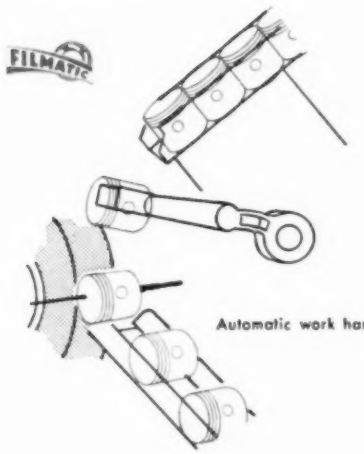


Air-electric gage sizing

FILMATIC spindle bearings



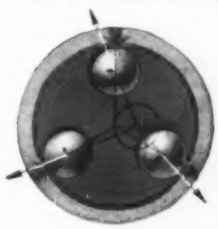
Automatic work handling

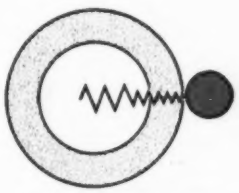
The unique advantages offered by integrated companies are familiar to nearly everyone. Cincinnati Milling's Grinding Machine Division gives you these advantages in the building of fine precision grinding machine equipment.

At Cincinnati your performance requirements get the attention of specialists in each applicable activity . . . methods, automation, quality control, experimental grinding. Cincinnati's large and experienced Engineering and Engineering Service staffs are supported by Basic Research, Physical Research, and Development Research Departments. Castings are made in our own foundry and manufacturing facilities themselves are the finest. Through the *Electro-Hydraulic and Gaging Division*, Cincinnati also engineers and produces the automatic size control equipment. And the *Products Division* supplies the grinding wheels and cutting fluids.

Only Cincinnati gives you such extensive experience and such wide variety of field-tested machines on which to base their recommendations: plain, universal, angular wheelslide, roll, centerless, Micro-Centric and chucking. Some of the feature-advantages incorporated in these precision grinding machines are illustrated here. On the following pages are two examples of the way in which these many outstanding features and integrated builder responsibility perform to your advantage. **Grinding Machine Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.**

Automatic wheel balancing





Gap eliminator—reduces grinding cycle time

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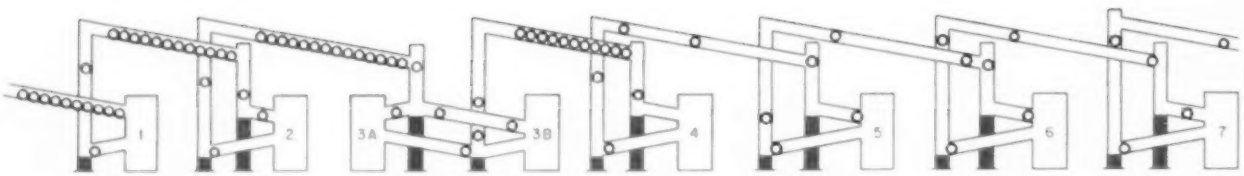
Feature-advantages include: automatic loading and unloading equipment, synchronized with the automatic grinding cycle; automatic truing; automatic sizing. And the biggest advantage of all is Cincinnati's integration of performance factors, from the drawing board to application of the grinding wheel. Only Cincinnati gives you this completeness of responsibility.

. . . BUILDS OPERATOR-CONTROLLED and COMPLETE



GRIND TO WIDTH | ROUGH GRIND I.D. | ROUGH GRIND O.D. (2 MACHINES) | ROUGH GRIND RIB | FINISH GRIND RIB | FINISH GRIND I.D. | FINISH GRIND O.D.

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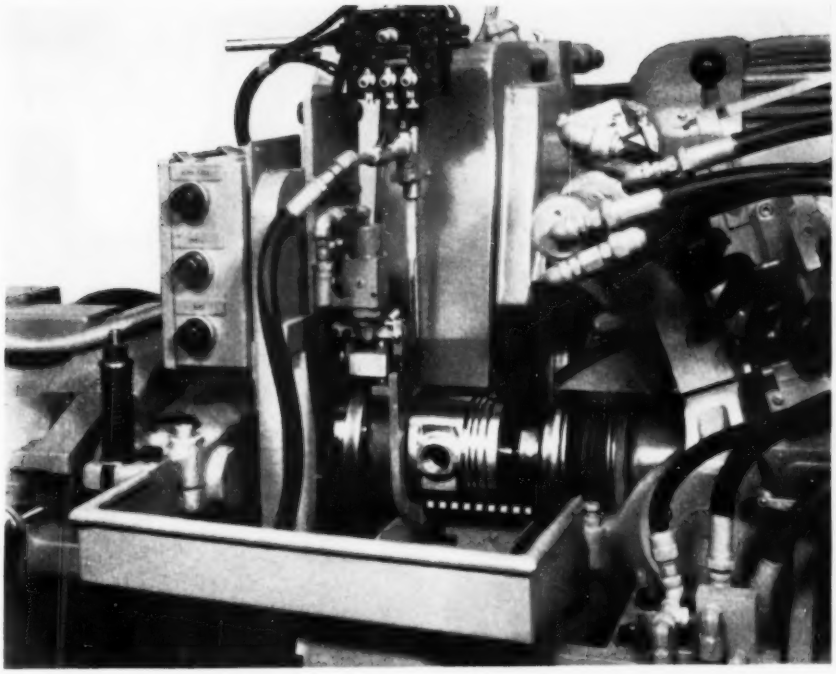
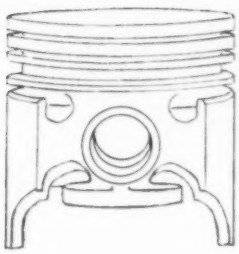


CINCINNATI FILMATIC Piston Relief Grinding Machine automatically grinds and sizes automotive piston. Production, 113 per hour.



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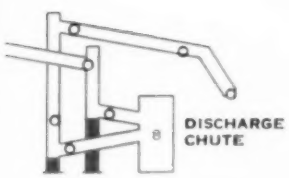
MACHINES
PRECISION GRINDING LINES



Operator-controlled CINCINNATI FILMATIC Grinding Machines are well known for their dependability and low-cost productivity. From the several types of these machines have evolved innumerable possibilities for precision grinding lines tailored to your requirements. The example diagramed here shows what can be done. It is an independent unit system, developed to grind five sizes of anti-friction bearing cones with a diameter range of 2 to 1. In all there are seven grinding and one polishing operation. Incorporated in the line are automatic sizing with feedback controls, automatic washing and demagnetizing, and a banking arrangement to take care of variations in production.

Cincinnati's outstanding degree of integration in supplying the complete equipment, including grinding wheels and electro-hydraulic and gaging equipment, is assurance of complete satisfaction with any machine or production line built by Cincinnati. May we give you more information?

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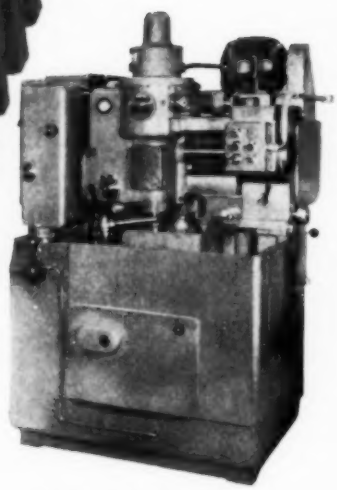
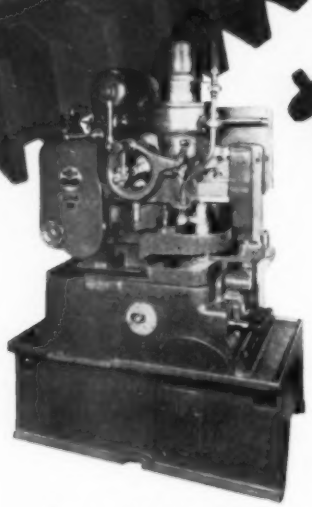
CIRCLE 173 READER SERVICE CARD

In Every Size Range ...Cut Costs with



FELLOWS NO. 4GS

Among the products for which gears are cut on the 4GS are automatic transmissions, gasoline motors, hoist and well drilling equipment, computers and aircraft reduction gear units.



FELLOWS 7A-TYPE

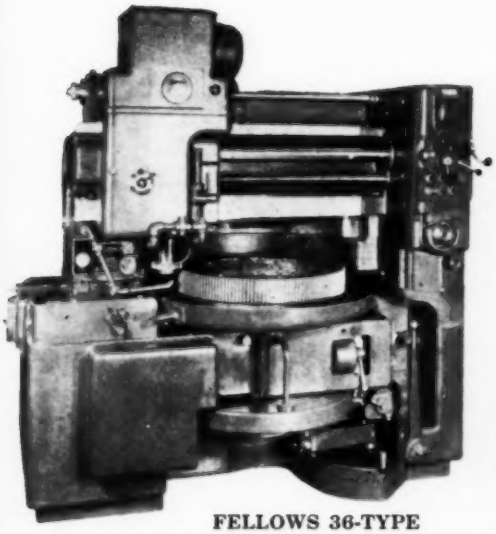
Gears cut on the 7A are used in textile machinery, servo-mechanisms, washing machines, cash registers, lawn mowers, machine tools and motorcycle engines.

FELLOWS 3-INCH FINE-PITCH

Used to cut gears for computers, bomb director and gun fire control systems, aircraft and flight control instruments, cameras and electro-mechanical mechanisms.

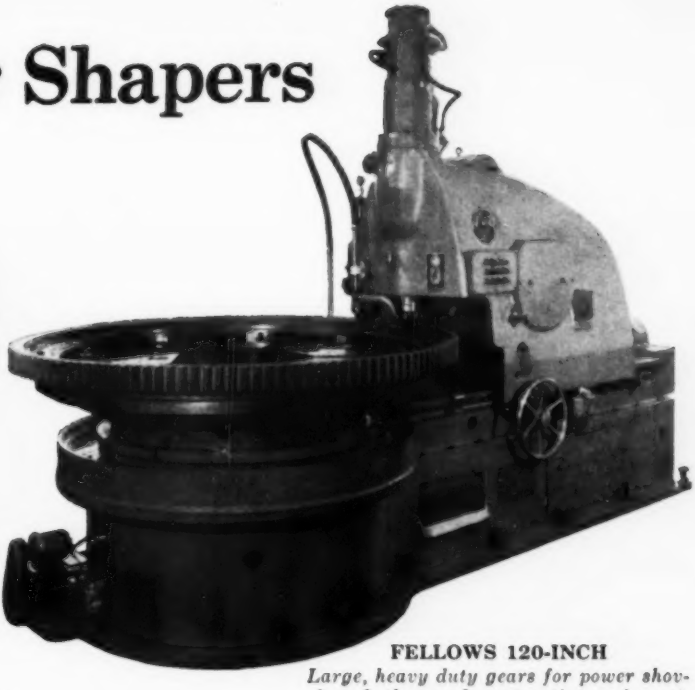
THE PRECISION LINE

Fellows Gear Shapers



FELLOWS 36-TYPE

Gears for construction equipment, textile machines, mining machinery, industrial truck transmissions, tractors, cranes and hoists are cut on this machine.



FELLOWS 120-INCH

Large, heavy duty gears for power shovels and other road construction equipment, heavy cranes, gun segments, tank turrets and winches are cut on the 120-Inch.

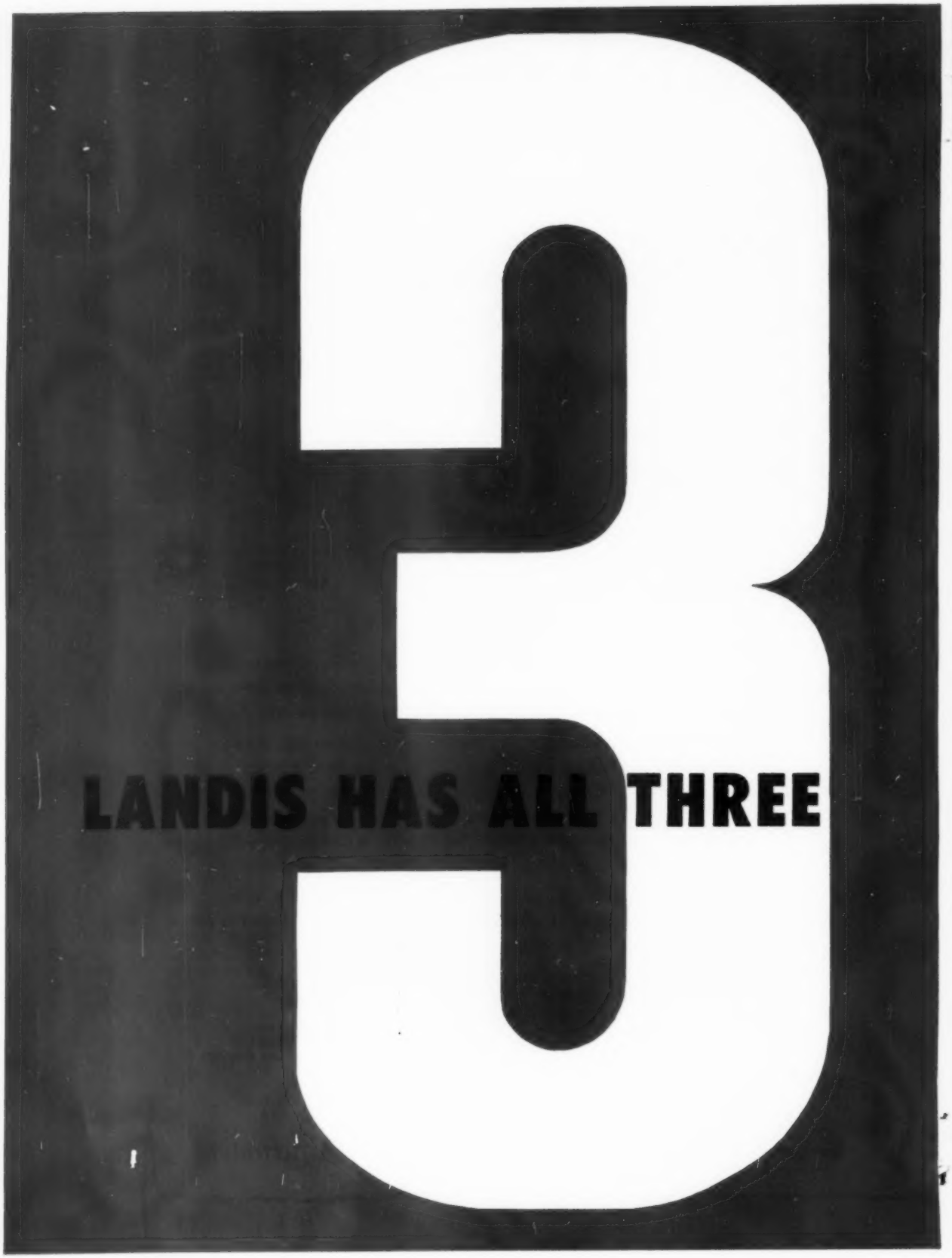
Modernizing cuts costs. In many plants the speed and versatility of new Fellows Gear Shapers has lowered gear production costs by more than a third and repaid the investment in just a few years.

Gear Shapers are ideal for many non-involute shapes too, such as internal and external splines, cams, clutches and nearly every other conceivable shape. Modifications to the Gear Shaper permit rapid, economical production of oval or elliptical gears. Fellows machines are available for either full- or semi-automatic operation for high speed, long-run production with a minimum of operator attention.

Your Fellows representative can show you where and how new machines from Fellows' Precision Line can lower your costs for small lots as well as for long production runs. Ask him for the facts.

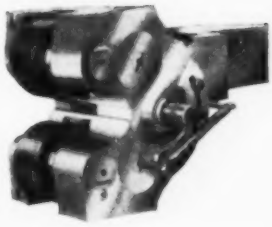
THE FELLOWS GEAR SHAPER COMPANY
78 River Street, Springfield, Vermont
Branch Offices: 1048 North Woodward Ave., Royal Oak, Mich.
150 West Pleasant Ave., Maywood, N. J.
5835 West North Avenue, Chicago 39
6214 West Manchester Ave., Los Angeles 45

Fellows *Gear Production Equipment*


3
LANDIS HAS ALL THREE

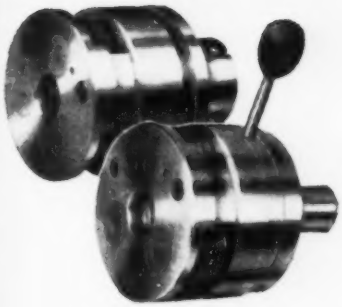
THREAD ROLLING MACHINES

. . . produce strong, accurate threads of excellent finish by the chipless, cold-forming process . . . produce left- and right-hand threads of all types (except square), including UNC, UNF, Acme, worm, and many special forms.



THREAD ROLLING ATTACHMENTS

. . . produce either straight or tapered threads . . . exclusive features include: tipping to avoid indexing interference . . . simple design allows disengaging attachment without disturbing set-up . . . and a gage determines precise position where vertical centerlines of both rolls and workpiece coincide.



THREAD ROLLING HEADS

. . . produce Class 4 threads of excellent finish at high speeds . . . feature replaceable helix angle bushings which allows rolling threads with exact helix angles without purchasing major head components.

Whatever your Thread Rolling requirement, there is a LANDIS machine or tool to do the job. Our detailed knowledge of the most efficient application of the different methods of thread rolling—and our more than 50 years experience in the threading field—has resulted in our producing a complete line of thread rolling equipment. Make LANDIS your one-stop source for all your thread rolling needs. When inquiring about Thread Rolling, describe your operation and send specifications.

LANDIS *Machine* COMPANY / WAYNESBORO PENNSYLVANIA

THE WORLD'S LARGEST MANUFACTURER OF THREADING EQUIPMENT

Threading Machines

Die Heads—Rotary & Stationary

Tags—Collapsible & Solid Adjustable

Centerless Thread Grinding Machines

Thread Rolling Tools

Thread Rolling Machines

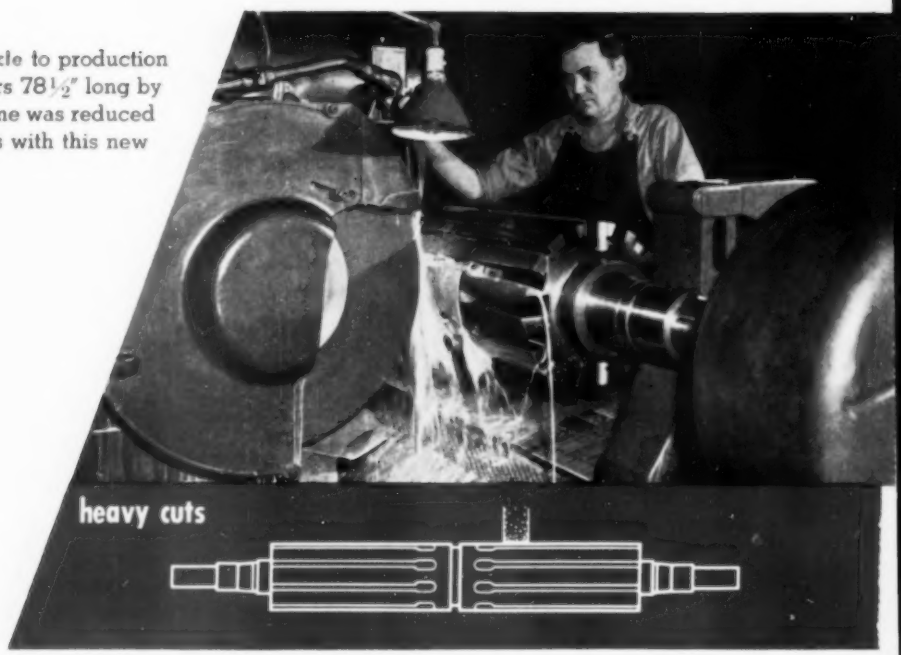
S50C

You Can Get Results Like These

from modern Landis

heavy cuts

Interrupted cut no obstacle to production of these slotted cylinders 78½" long by 13⅝" O.D. Grinding time was reduced from 7 hours to 6 hours with this new Landis grinder.



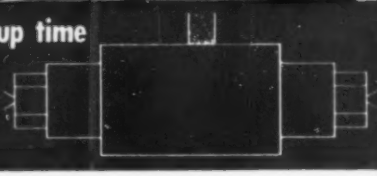
LANDIS 24" x 120" type FR Roll Grinder
Detailed specifications in Catalog F-48.
Send for your copy today.

LANDIS

precision grinders

type FR Roll Grinders . . .

savings in set-up time



savings in set-up time

Regrinding roll for cold rolling operations. Patented crowning mechanism insures exact duplication of crowning setting on every job. Rolls have 20" face and are 12" O.D. Grinding time is 20 minutes floor-to-floor.

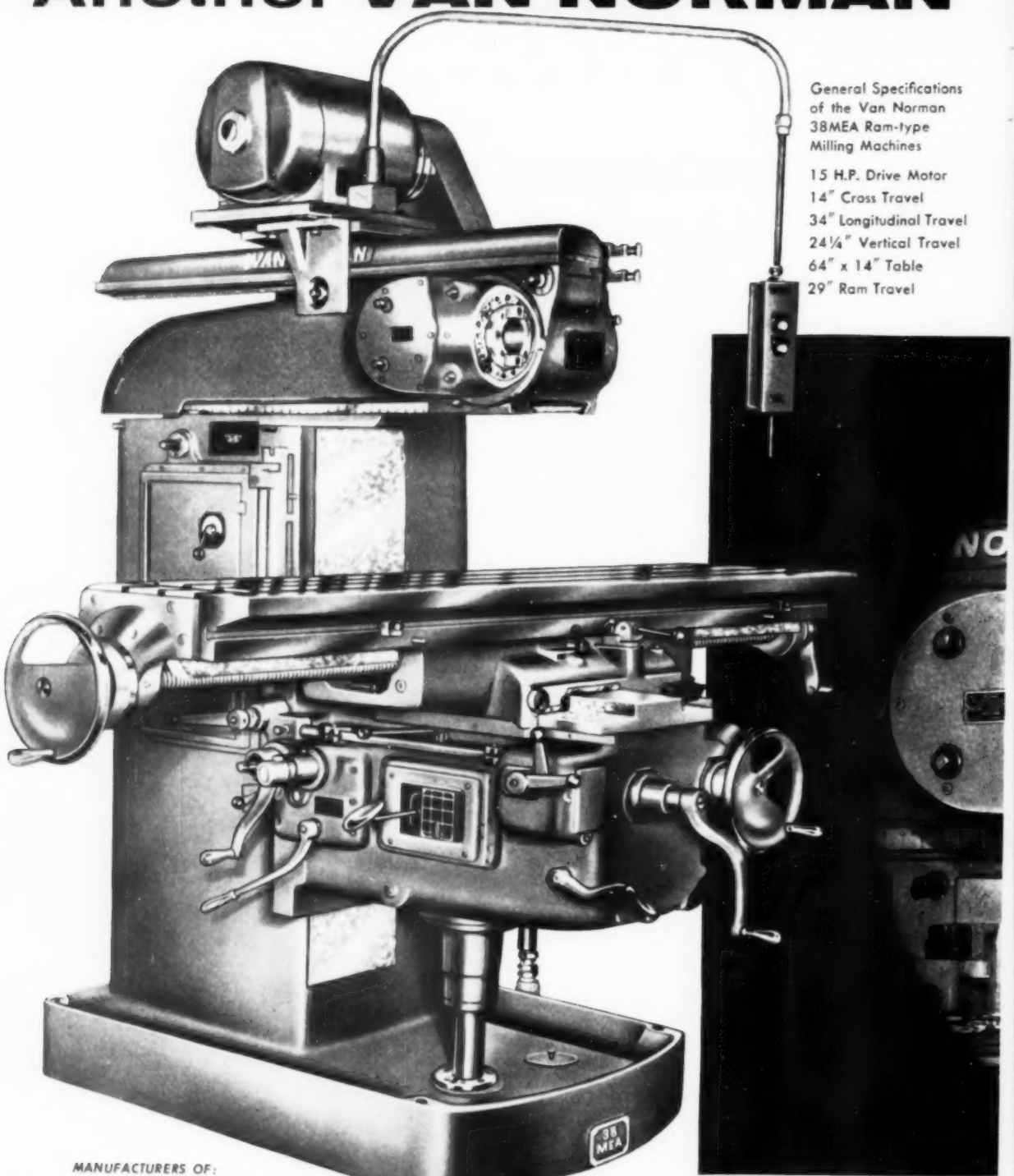
fine finishes

.040" stock removal to 6 micro inch finish are requirements for grinding this 32⅝" long by 13" O.D. main ram. Floor-to-floor time is 4 hours.

fine finishes

LANDIS TOOL COMPANY / WAYNESBORO, PENNA., U. S. A.

Another VAN NORMAN

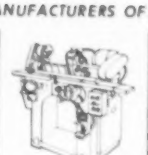


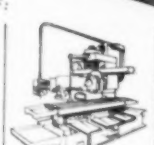
General Specifications
of the Van Norman
38MEA Ram-type
Milling Machines

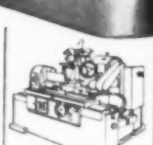
15 H.P. Drive Motor
14" Cross Travel
34" Longitudinal Travel
24¼" Vertical Travel
64" x 14" Table
29" Ram Travel

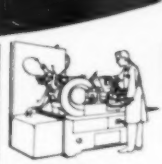
MANUFACTURERS OF:

Milling Machines


Standard Cylindrical Grinders


Bed-type Mills

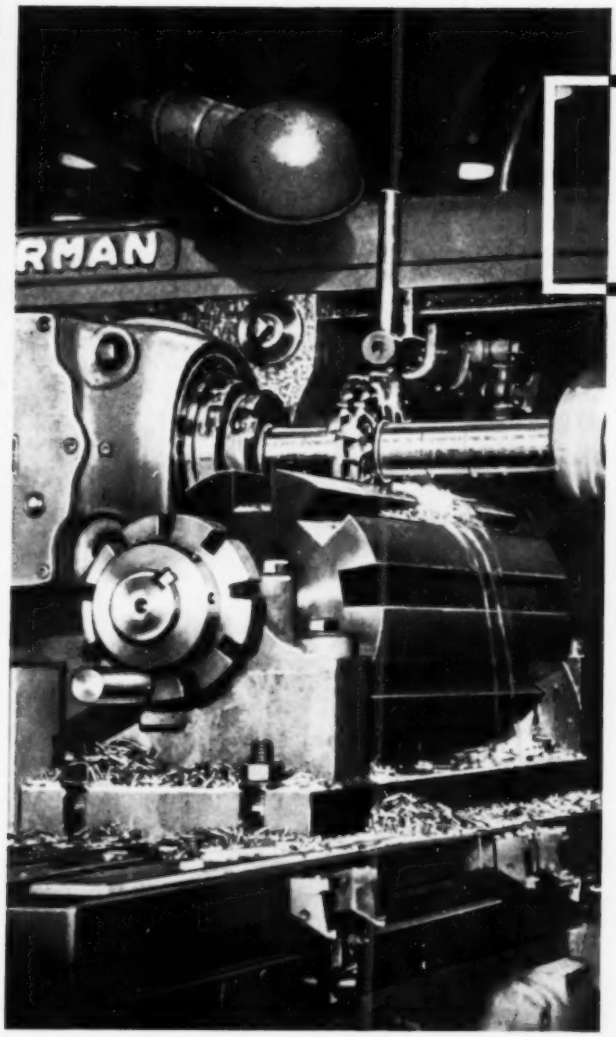

Production Grinders

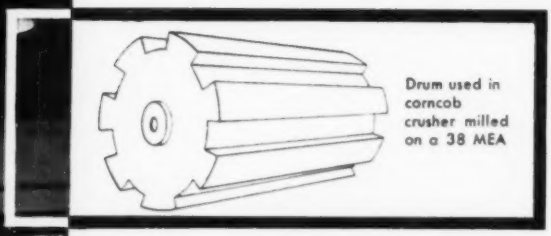

Centerless Grinders

VAN NORMAN

SPRINGFIELD 7, MASSACHUSETTS

Cost Saving Application
Featuring a
VAN NORMAN Ram-type Mill





Drum used in corncob crusher milled on a 38 MEA

Versatile, new Van Norman milling machines are today being used for a wide variety of precision milling operations by all forms of industry. One reason for the growing popularity of these production mills is the increased size of the column, ram and table, giving them greater range and versatility than ever before.

Here's but one example how a Van Norman ram-type mill is economically solving a production milling problem:

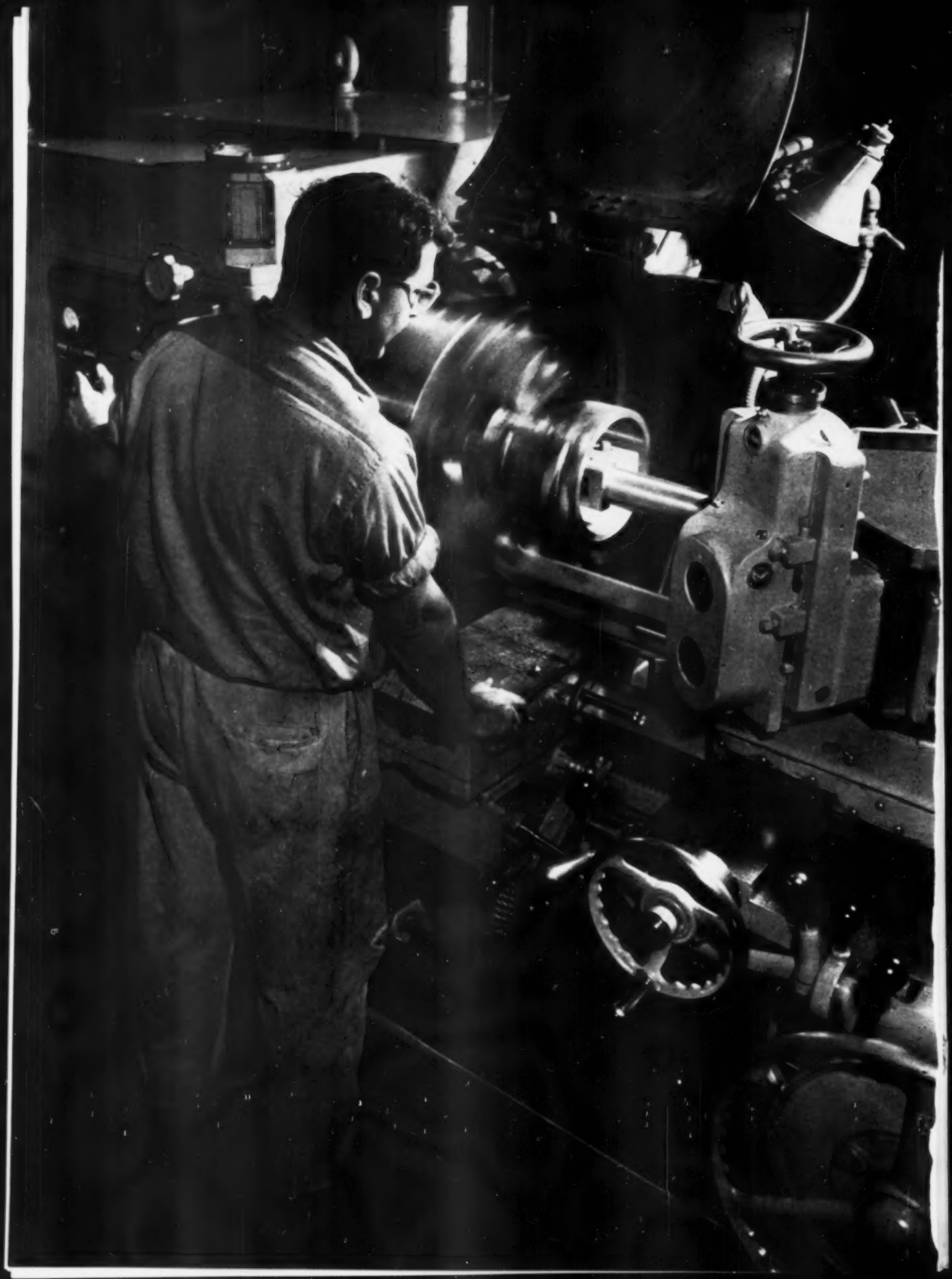
Equipped with a special indexing fixture, a Van Norman 38MEA easily mills 12 slots the length of a drum used in a corncob crusher. It mills one 1½" wide x 1¼" deep slot at a time, using two staggered milling cutters. The material being milled is 1045 steel. This large workpiece is easily handled on a standard machine having a 24¼" vertical feed and a 14" cross feed.

This is a typical illustration of the many milling jobs being done today with large capacity, heavy-duty Van Norman mills. The oversize column, ram and table mean that standard Van Norman mills can be adapted to many jobs that normally would require two or more milling machines of a larger size.

Investigate this versatile Van Norman mill today. Write for a complete catalog.

MACHINE COMPANY
A DIVISION OF VAN NORMAN INDUSTRIES, INCORPORATED

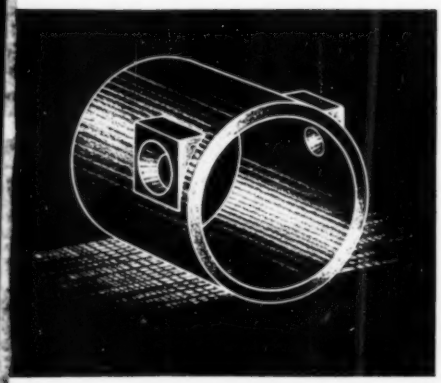
Don't wait . . . for extra profit install a Van Norman machine now! They are available in many purchase plans . . . Outright sale . . . Purchase on conditional sales contract up to five years . . . Pay as you depreciate up to 10 years. Conditional Sales Contracts not available to Export.



At Reliance Electric and Engineering Co.

This 4-A Turret Lathe will pay itself off in only 3 years!

By eliminating a time-consuming operation and permitting higher surface speeds in machining electric motor frames — while still maintaining desired accuracy and finish — this versatile Warner & Swasey has more than cut production time in half.



The Reliance Electric & Engineering Co. plant in Ashtabula, Ohio, had a definite problem. They wanted to increase production—lower costs on machining five basic sizes of AISI 1010 and 1020 steel DC motor frames in small lots—25 to 30 pieces. This job required two different vertical turret lathe operations to hold a .002" tolerance in counterbores and a .005" tolerance in the through bores.

After an exhaustive survey of available machining equipment, Reliance selected a new Warner & Swasey 4-A Saddle Type Lathe, with a cross sliding hexagon turret, to handle this important job.

Now, due to the rigidity and accuracy of the 4-A's self-guiding Vee-Ways, and flexibility of cross sliding turret tooling, all frame sizes are easily completed in only one chucking operation holding .002" in all bores. Only size and stop adjustments are required when changing sizes. Thus, set-up time has been reduced ½ to ⅔ with the Warner & Swasey on the job.

Carbide tooling and the availability of faster speeds in the 4-A's all hydraulic headstock –plus the rugged design of the lathe, tooling and fixture – have more than doubled machining speeds. On larger frames rough and finish boring is done up to 1050 SFM – smaller sizes are roughed at 880 SFM and finished at 1206 SFM.

If your jobs require extreme machining accuracy with heavy metal removal, call in our nearest Field Representative. He'll show how the right machine—with the correct tooling—can most efficiently increase your production—and profits, too.

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS

...WITH A WARNER & SWASEY

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

With fast change-over features like these...

Norton Universal Grinders do more...save more

The flexible grinding wheel head swivels above and below the slideways, permitting independent angular settings of wheel and feed — giving you the widest job range.

You can change from dead center to chucking work with minimum effort. Chuck remains mounted at back end of headstock when grinding "on centers".

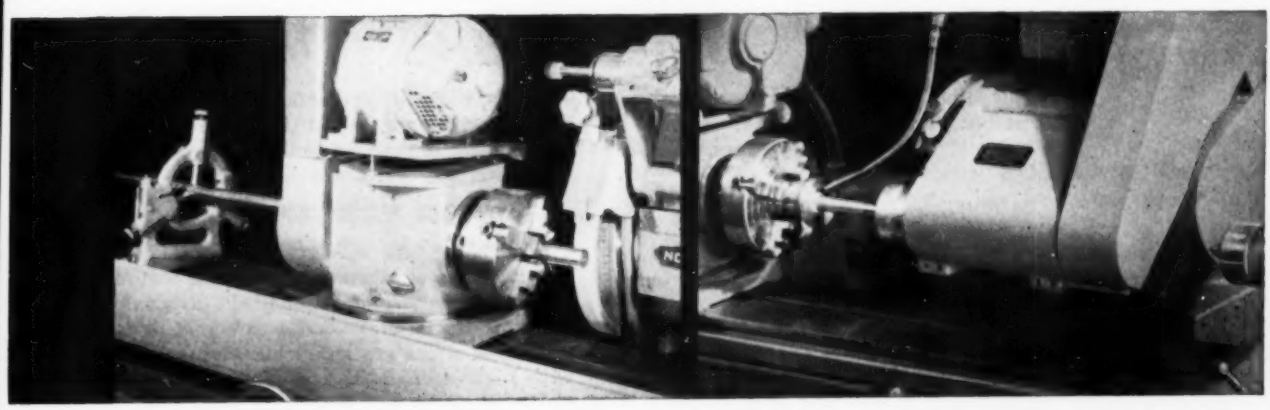
A Norton 12" Type U-4 Universal Grinder, available with 36" or 48" nominal lengths between centers, typical of Norton Universals.

Install any Norton Universal Grinder and you've got a practically complete grinding department — for faster external, internal, face, taper and angular wheelslide grinding, including many special jobs. That's because Norton builds exceptional versatility into all these famous universals, with time-and-money-saving "Touch of Gold" advantages like the following:

Extremely rapid chucking . . . quick changeover to live or dead spindle operation . . . wide range of easily changed work speeds . . . independent wheel and feed settings for doing difficult jobs fast . . . extra capacities in wheel head and headstock . . . precise swivel table alignment with the SWIVALIGN* *Dual Electric Indicator and semiautomatic plunge feed arrangement optional extras.*

Engineered for long service life in handling so many different jobs, Norton Universal Grinders are easy to operate and maintain. Their swing capacities range from 10" to 18". Your Norton Sales Engineer, a trained expert in the grinding field, will be glad to help you select the size you need — and to give you an accurate estimate of what this grinder can do for you. NORTON COMPANY, Machine Division, Worcester 6, Mass. District Offices: Worcester, Hartford, Cleveland, Chicago, Detroit. *In Canada:* J. H. Ryder Machinery Co., Ltd., Toronto 5.

*Trade-Mark Reg. U.S. Pat. Off. and Foreign Countries



Hollow headstock spindle gives you additional capacity for grinding long bars by passing them clear through and supporting them in grinding position.

Hinged-bracket type internal grinding spindle swings up and out of the way when not in use. This means quicker set-ups for your I.D. or O.D. grinding.

NORTON
GRINDERS and LAPPERS
Making better products
...to make your products better

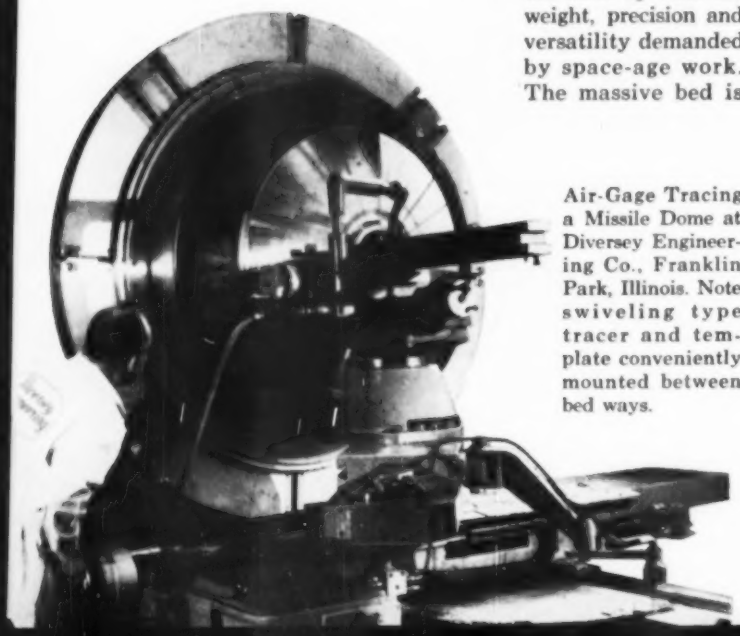
NORTON PRODUCTS Abrasives • Grinding Wheels • Grinding Machines • Refractories • Electrochemicals — BEHR-MANNING DIVISION Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes

Don't Tool Up

6 THE MISSILE MASTER—finest of the

This is *the* lathe for you—if you are interested in the contour turning, boring and facing of missile components or other large thin-walled and fabricated parts.

As these photos tell you, this machine is BIG. And it's newly-designed for size from the floor up with the weight, precision and versatility demanded by space-age work. The massive bed is 54" wide, with extra-wide, flame-hardened and ground carriage ways. And you can almost feel the strength in the specially-designed headstock, carriage, slides and tailstock.



Air-Gage Tracing a Missile Dome at Diversey Engineering Co., Franklin Park, Illinois. Note swiveling type tracer and template conveniently mounted between bed ways.

EXCLUSIVE PERFORMANCE FEATURES

The swiveling type Monarch Air-Gage Tracer generates complex shapes in an extreme contour range with an efficiency unequalled through any other means. Its unrivalled accuracy of reproduction is of the greatest value when working with high strength alloys, in complex thin-walled sections which must be machined to ultra-close tolerances and critical surface finishes. You'll like the template mounting between the bed ways. This permits easy adjustment from the front of the machine. Template tool control is possible over work diameter variations up to 70".

Large diameter work requires low spindle speeds. Augmenting the spindle drive, the time-proved, exclusive Monarch face plate drive assures full power applied far out from the work axis. This also widens the speed range, affording a choice of 24 speeds. Constant surface cutting speed control over a 4 to 1 range is available.

CIRCLE 186 READER SERVICE CARD

for Tomorrow's Boom with Yesterday's Lathes

MONARCH SPECIAL PURPOSE LATHES OF TOMORROW

The Monarch Missile Master. Swing over bed, 65"; swing over cross slide, 37". Length between centers in increments of 48", up to 300".

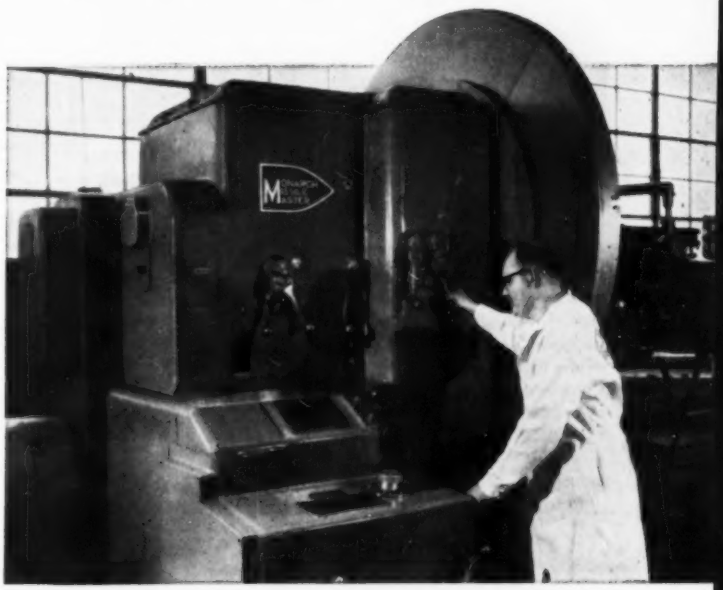
space-age giants—*New from the floor up*

CHECK THE FIELD

We invite your comparison of the Missile Master to any other lathe that might be considered in its class. Send for our Specification Brochure #2101. Then—if you really want to get your space-age work off the ground—make floor-space for the Missile Master! . . . The Monarch Machine Tool Company, Sidney, Ohio.

MISSILE MASTER APPLICATIONS

Missile Parts: Nose sections, nozzles, motor cases, bulkheads, air frame sections, hemispherical or elliptical domes.
Other Parts: Any large, thin-walled and fabricated parts: rolls, cylinders, spiders, jet engine components, valve gates, electrodes, etc.



We Don't Expect a Boy to Do a Man's Work! Look at that massive face plate drive headstock. Gear box is totally enclosed as you would expect on a modern lathe.

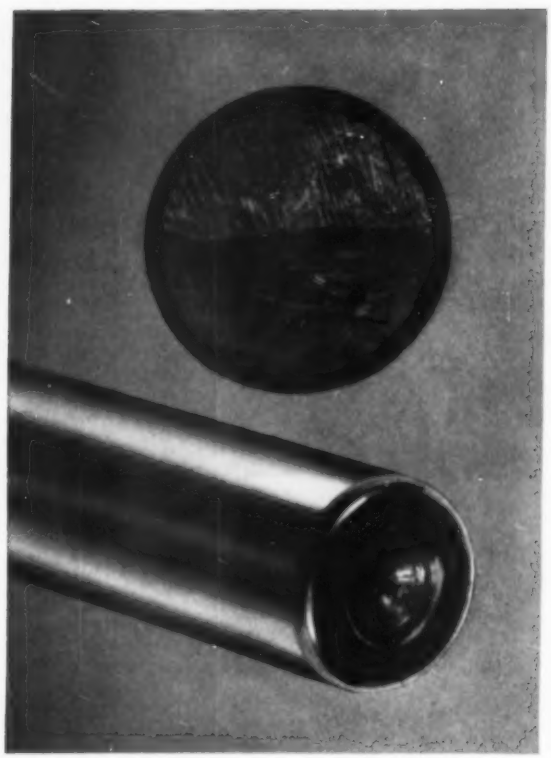
Monarch
TURNING MACHINES

IF IT CAN BE TURNED, THERE'S A MONARCH TO DO IT BETTER AND FASTER

CIRCLE 187 READER SERVICE CARD

You benefit seven ways from Republic Steel Bar

SERVICE IN DEPTH



COLD DRAWN CARBON CORRECTED BARS HELP BRIGGS & STRATTON BOOST PISTON PIN PRODUCTION. The company was experiencing production difficulties and was not satisfied with piston pin quality from a performance standpoint. On the advice of a Republic Field Metallurgist, Briggs & Stratton switched to Republic C-1050 Cold Drawn Carbon Corrected Bars. The results were immediate. Production increased substantially. Rejects dropped to a minimum. Pin quality maintained at the highest level. Other advantages of Cold Drawn Carbon Corrected Bars include: Better machinability. Savings in both metal and money by eliminating waste. No need to buy bars oversize to allow for decarb removal. Photo shows finished piston pin used in Briggs & Stratton 1¾ to 3 hp engines. Note induction hardening in cutaway view.

Steel bar service in depth is an exclusive Republic concept, designed to help you solve steel bar problems and to benefit you these seven ways:

1. Facilities—Republic bar mills are strategically located in relation to major use areas. Hot rolled mills at Cleveland, Youngstown, Buffalo, Massillon, Chicago, Canton, Gadsden; cold finished mills at Massillon, Hammond, Beaver Falls, Hartford, and Los Angeles.

2. Abilities—Republic's broad and specialized experience has been gained as the nation's number one producer of alloy and carbon bars, and leader in the production of special quality steels, such as forging bars.

3. Shapes and Sizes—Modern bar mills produce a complete range of sizes and materials—carbon, alloy, stainless, and titanium—in ¼″ to 10″ rounds, also squares, hexagons, octagons, flats, and special sections.

4. Variety—In addition to regular merchant quality, production includes coil spring and spring bar quality, cold heading and cold extrusion quality, high quality alloy and carbon steel bar products in heavier weight coils.

5. Quality—Republic combines quality control at every step of production with the most advanced features of bar mill design to meet today's exacting requirements for high quality steel bar products.

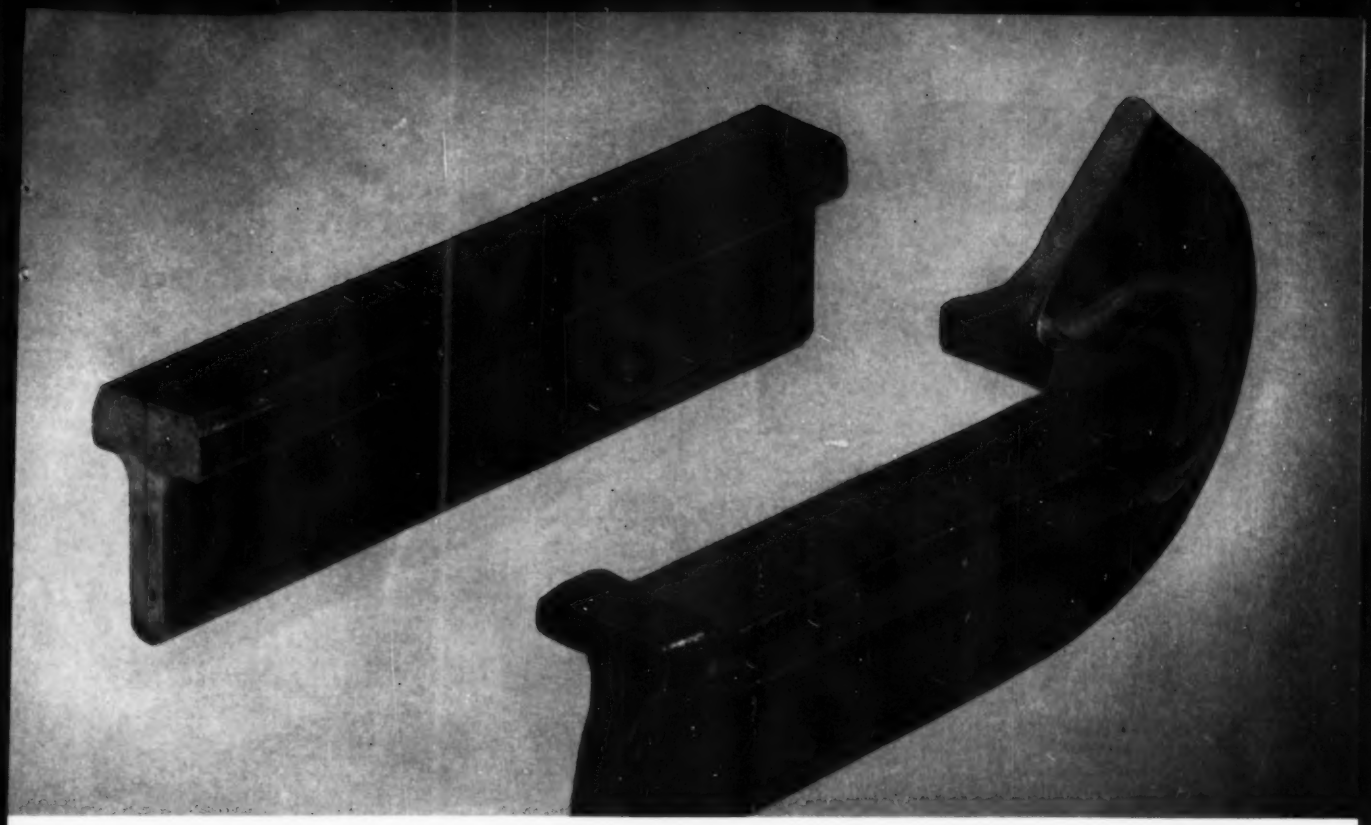
6. Dependability—Republic's aim has been to build capacity to provide more steel tonnage for existing customers as well as supply additional users. Assurances of steel to customers are real assurances. Orders are not taken by Republic unless capacity is available to fill them.

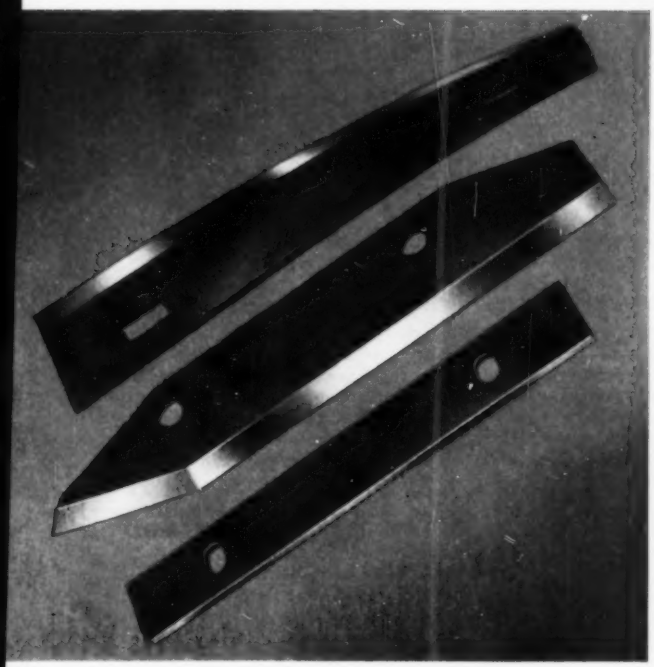
7. Metallurgical Service—Republic's famed 3-Dimension Metallurgical Service Teams—field, mill, and laboratory—are always available to help your personnel apply Republic's high quality bar products to your product. Carbon, alloy, stainless, and titanium metallurgists will assist in the selection, application, and processing of the right bar product for the job. No obligation. The coupon is your invitation to use this service.

Here are three examples of steel bar *service in depth*.

REPUBLIC

World's Widest Range of Standard Steels





REPUBLIC HOT ROLLED SPECIAL SECTION REDUCES COST on this rail anchor through elimination of most machining and forming operations. The special section is preformed to the predominating cross section of the part. If you design or produce steel parts you will be interested in these advantages of Republic Special Sections: (1) Almost limitless flexibility in design. (2) One-piece shapes replace costly assemblies. (3) Simplification of built-up, interlocking or associated parts. Republic Special Sections are available hot rolled or cold drawn in carbon, alloy, titanium, and stainless steel. Send coupon for full facts.

3-D METALLURGICAL SERVICE HELPS AGRICULTURAL KNIFE MANUFACTURER SLASH PRODUCTION COSTS. Lund Products Company, Maynard, Massachusetts, produces cutting knives for agricultural equipment. A quality product, Lund wanted to make them better to withstand even the most severe abuse. Republic metallurgists offered advice on practices and procedures in working alloy steels. The result? A superior cutting knife, produced at a substantial reduction in cost. 3-D Service is available to all steel users without obligation. Clip and mail coupon.

STEEL

and Steel Products

CIRCLE 189 READER SERVICE CARD

REPUBLIC STEEL

REPUBLIC STEEL CORPORATION
DEPT. AM-7700
1441 REPUBLIC BUILDING • CLEVELAND 1, OHIO

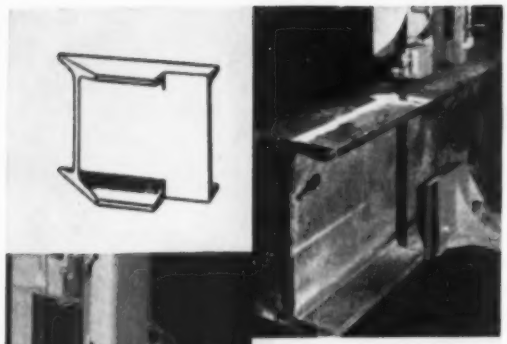
Have a metallurgist call: ☐ Carbon ☐ Alloy ☐ Stainless
Send more information on:
☐ Cold Drawn Special Sections ☐ Carbon Corrected Bars
☐ Alloy Steel Bars

Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____



COPING AND MITERING HEAVY STRUCTURAL SHAPE

18" Beam (above) is held between vises for the short cut. On the long cut (left) vises were removed and beam held by simple clamp. The MARVEL Band Saw is truly indispensable in ornamental and structural iron shops where this type of work is done daily. The machine will cut-off square, miter and cope any work shape from the smallest moulding to 18" I-beams.

SPLITTING CLAMP RINGS, BUSHINGS

Splitting clamp rings, connecting rods, bushings and collets is a fast, simple operation on the No. 8 Band Saw. Perfect control, quick chucking facilities, accuracy and speed are features that especially fit the machine to handle this type of work.

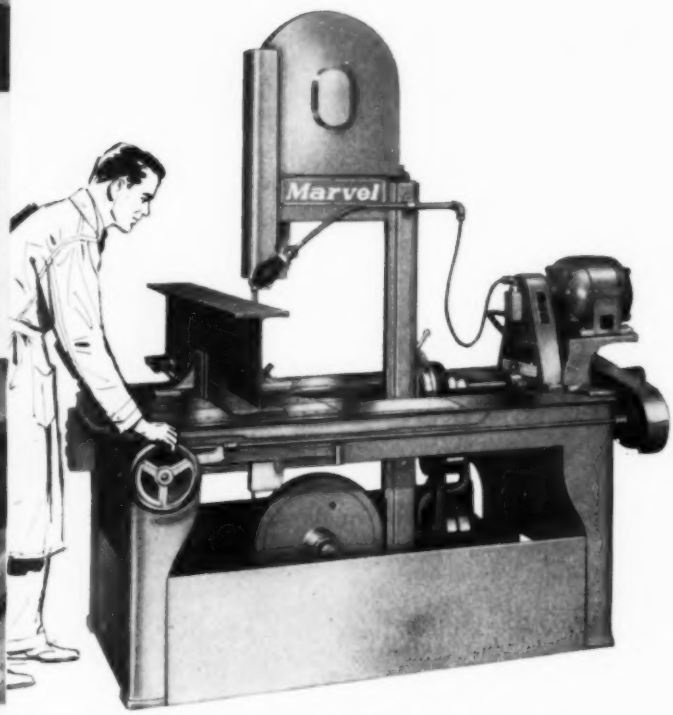
MITERING LARGE DIAMETER PIPE

Pipe (or any bar shape) may be mitered at a 45° angle without the need for special jigs or fixtures. Even when cutting miters, work remains in the same position as it does for straight cuts. Column and blade are instantly tilted to desired angle, even without stopping the machine. Perfect miters (or lesser angles) are sawed without any layout or special equipment.

SEGMENTING LARGE DIE BLOCK

Three equally spaced re-entrant cuts were made in this 16" x 18" SAE 4130 Forging. Job was completed, floor-to-floor in 5 hours. No special jigs or fixtures were required. An unusual job that serves to emphasize the versatility of the MARVEL No. 8 Saw.

"The One Machine We Couldn't Do Without"



"As simple to use and handy as a Scout Knife" is the way another user described his MARVEL No. 8 Universal Band Saw recently . . . and we can't think of a better way to describe this versatile metal cutting machine.

With a MARVEL No. 8 Band Saw, you can do almost any conceivable straight, angle, or miter metal sawing job—from cutting-off bar stock to making the most unusual forming cuts. You can handle small, delicate work, and in the next minute, saw structurals, or segment large work as illustrated in the lower photograph. You will save time, labor, and material with a MARVEL No. 8 Band Saw because no other saw has all the features to be had in this truly universal tool.

Upright column design and forward travel of the blade through the work (which remains stationary on the table-height saw bed) provides easy, unobstructed visibility and more convenient and efficient working conditions; column can be tilted and locked at any angle up to 45° left and right of vertical; the exclusive MARVEL Power Feed with Automatic Overload Relief; Automatic cutting-depth stops; simple, convenient operating controls—these are some of the features which make the No. 8 Band Saw the most useful—and used—metal cutting saw on the market.

For the complete story, ask or write for Bulletin 875 which illustrates and describes MARVEL Universal Metal Cutting Band Saws.

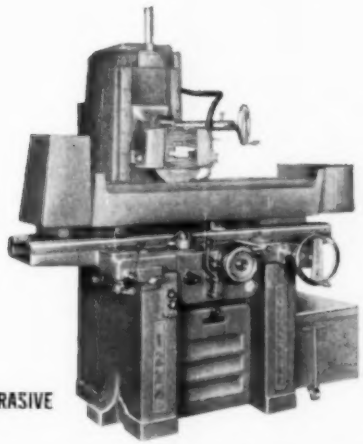
MARVEL Metal Cutting SAWS
Better Machines-Better Blades

ARMSTRONG-BLUM MFG. CO. 5700 N. BLOOMINGDALE AVE. • CHICAGO 39, ILL.

the ABRASIVE line

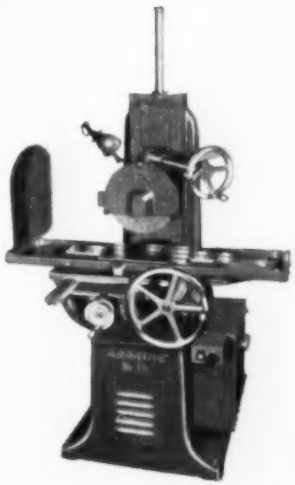
of precision surface grinders

first for accuracy...first for value



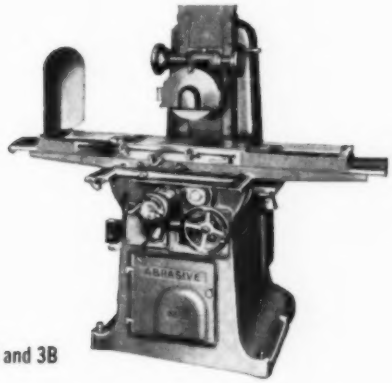
HYDRABRASIVE

The modern line of hydraulically operated surface grinders for general machine shops, production operations and tool shops. Four sizes with 12" wheel and 3 hp motor.



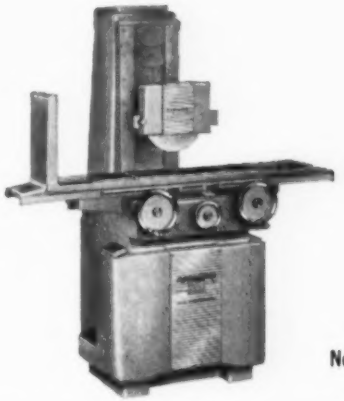
No. 1½

This is probably the most popular machine for tool and die work. Hand operated with a 12" wheel for deep slot grinding, 1 hp motor and 10" x 15" x 12" size.



No. M3 and 3B

For production and toolroom jobs where a fast, accurate surface grinder is needed with power table traverse and cross feed. M3 has 2 hp motorized spindle. 3B has 3 hp main drive with belt to spindle. Both 8" x 24" x 12" capacity with 10" wheel.

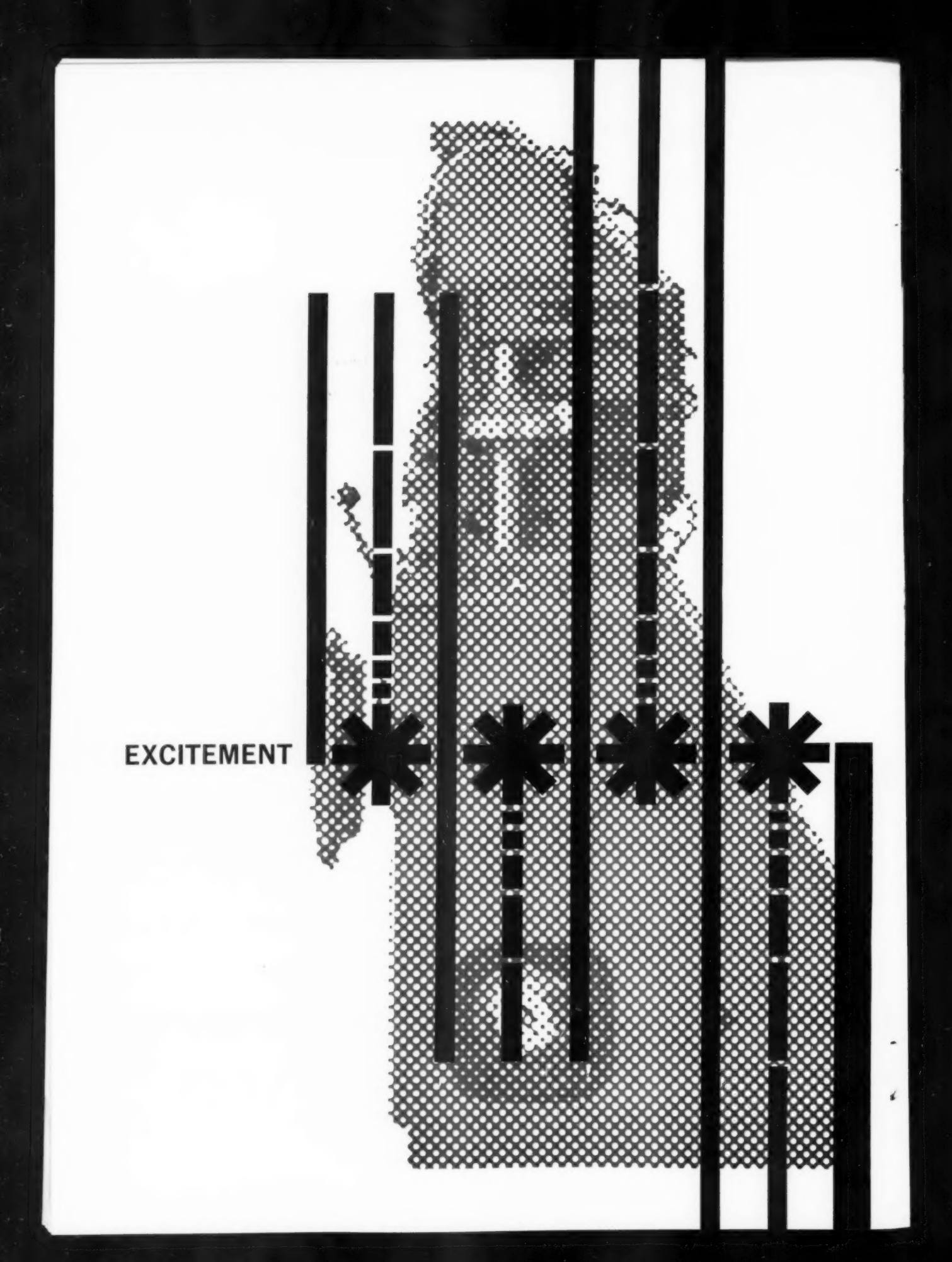


No. 618

One of the newest and most modern machines of its size for easy hand operation and dependable precision results. It's available with either a 7" wheel and 1 hp motor, or a 12" wheel with 2 hp motor.

ABRASIVE
precision surface grinders

a product of
LANDIS TOOL
world's largest manufacturer of
precision grinding machinery
WAYNESBORO, PENNSYLVANIA

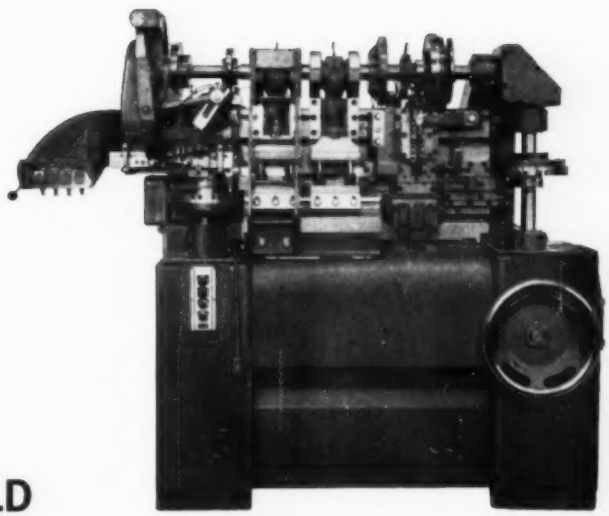

EXCITEMENT

Once in a blue moon, a really exciting new production machine is developed . . . and this is it!

It's the Torrington **Verti-Slide** which promises a genuine revolution in the production of just about everything in strip forming that is now being produced by progressively tooled presses.

Single-handed, the Torrington **Verti-Slide** has already demonstrated its ability to replace as many as six presses in high speed precision production of complex parts.

Cooler heads than ours are telling **us** that it's the most exciting new development in its field in half a century.



IN THE PRODUCTION WORLD

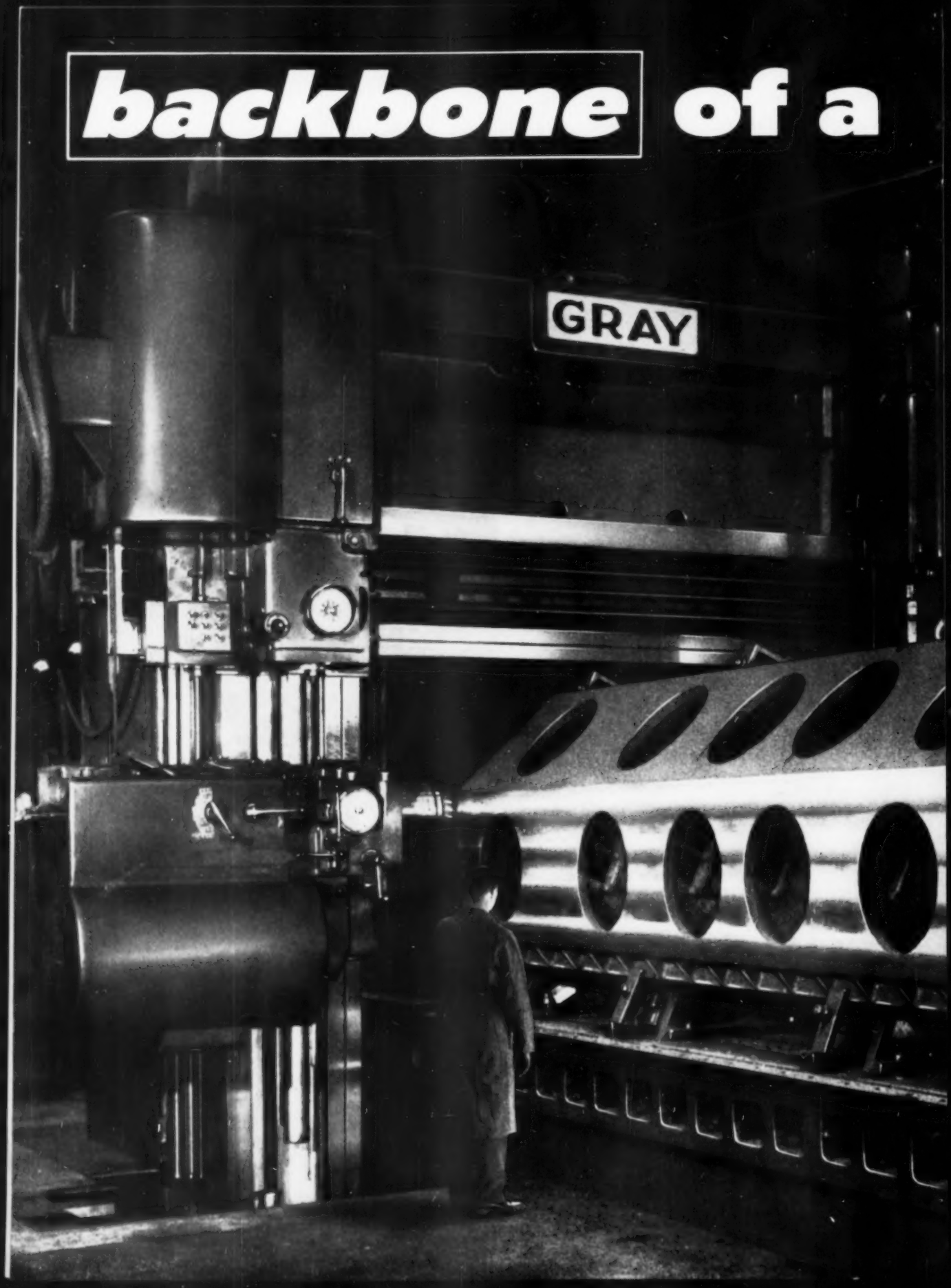
Write or call today for complete data—or a Torrington sales engineer.

THE TORRINGTON MANUFACTURING COMPANY
TORRINGTON, CONNECTICUT · VAN NUYS, CALIFORNIA · OAKVILLE, ONTARIO

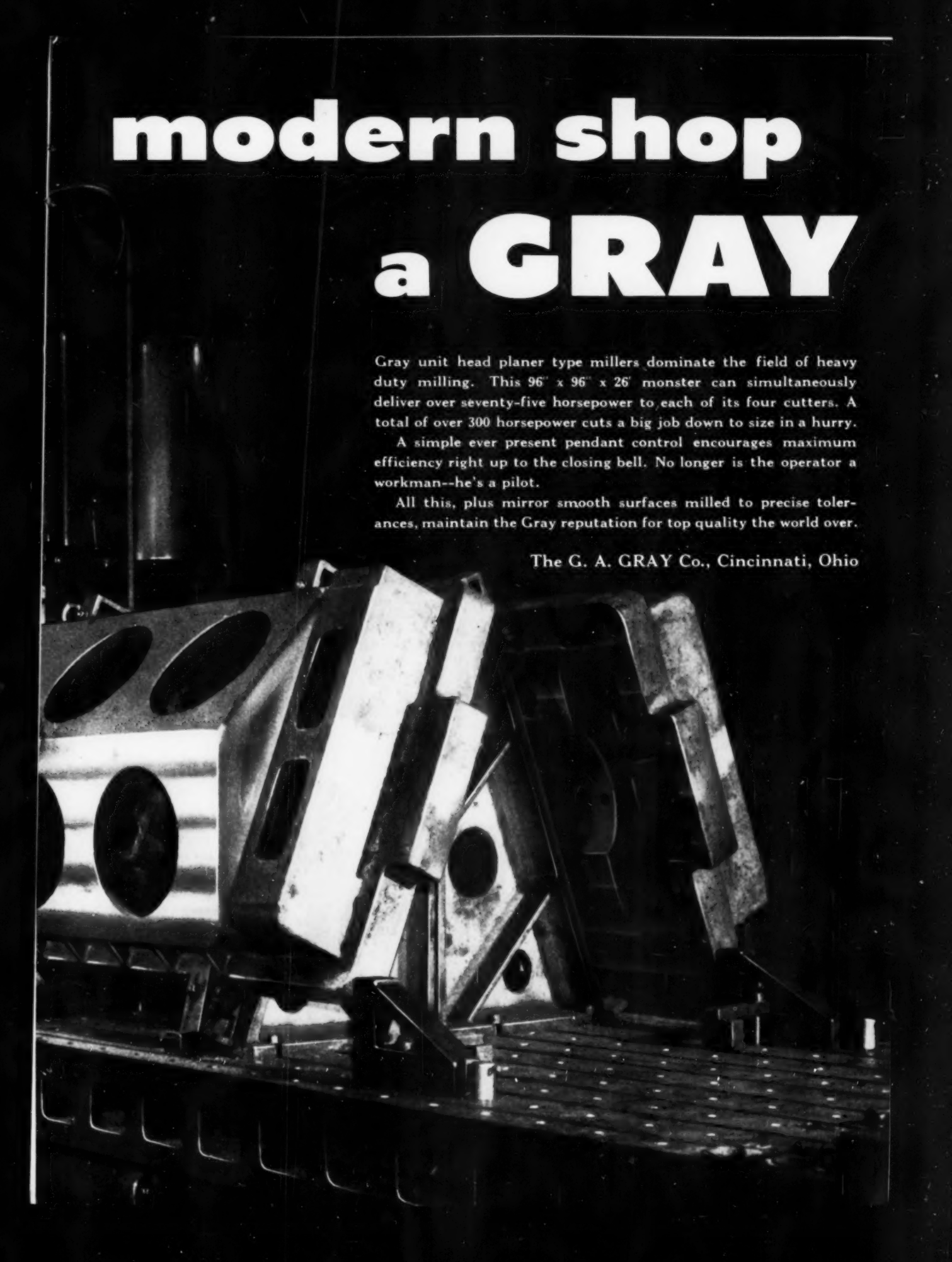
◄ CIRCLE 192 READER SERVICE CARD

CIRCLE 193 READER SERVICE CARD

backbone of a



modern shop a GRAY



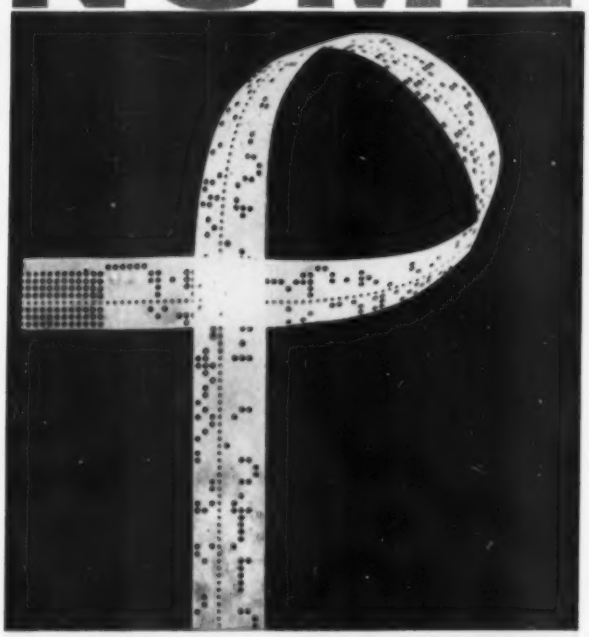
Gray unit head planer type millers dominate the field of heavy duty milling. This 96" x 96" x 26' monster can simultaneously deliver over seventy-five horsepower to each of its four cutters. A total of over 300 horsepower cuts a big job down to size in a hurry.

A simple ever present pendant control encourages maximum efficiency right up to the closing bell. No longer is the operator a workman--he's a pilot.

All this, plus mirror smooth surfaces milled to precise tolerances, maintain the Gray reputation for top quality the world over.

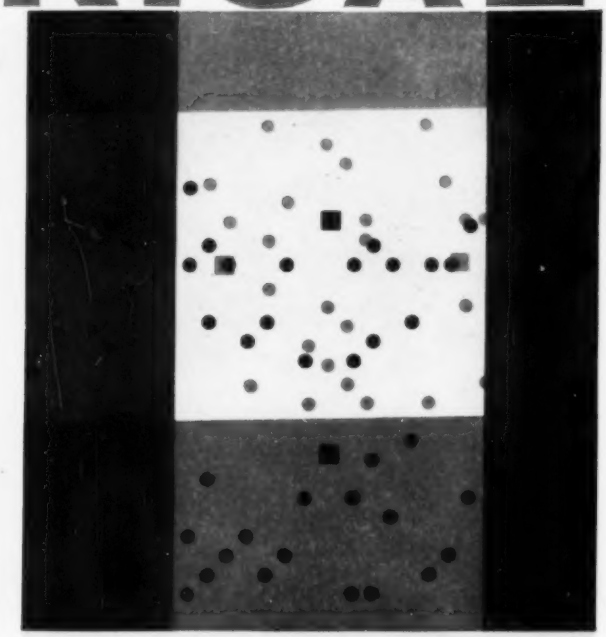
The G. A. GRAY Co., Cincinnati, Ohio

NUMERICAL



1" 8-CHANNEL COMMUNICATIONS TAPE

Inexpensive, widely used throughout industry, these tapes may be prepared simply on a Flexowriter or similar equipment, usually by the Production Engineering Dept. Provides a typewritten record automatically for easy checking against pre-planned program.



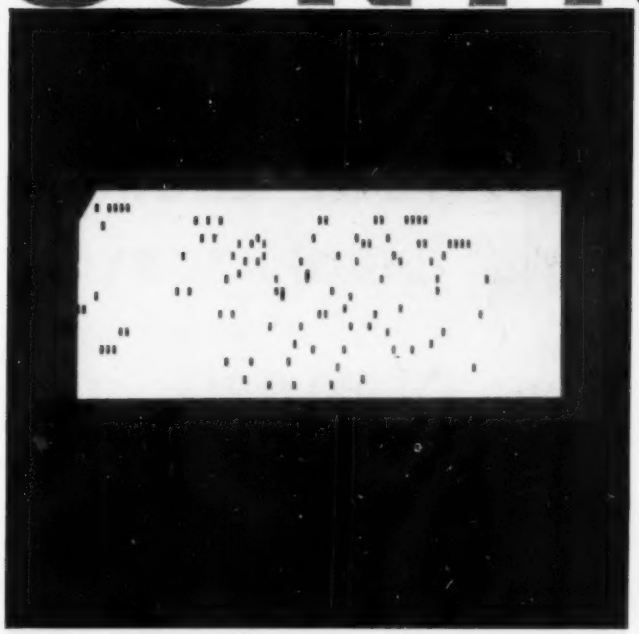
4" MYLAR PLASTIC TAPE

Least expensive of the generally accepted tape systems, particularly suitable for smaller shops machining parts with relatively few holes. Tape can be prepared easily by shop personnel.

1" 8-CHANNEL COMMUNICATIONS TAPE

4" MYLAR PLASTIC TAPE

CONTROL



for Fosmatic JIG BORERS and JIG GRINDERS

Any tape or card reader can be used to control a Fosmatic Jig Borer or Jig Grinder. And because the functions of the standard Fosmatic are actuated electrically, numerical control can be installed in the field—economically!

Speeds and feeds are changed by controlling electro-magnetic clutches through relay contacts. Table and saddle position is determined by a measuring system actuated by direct reading dials. For numerical control, these dials are driven by a fractional hp motor.

On a Fosmatic, you can program as many functions as you wish. Table X and Y positions (to .0001"), Feeds and Speeds, Spindle start and stop, Spindle feed start and stop, Spindle feed depth, Spindle head height, Automatic tool change. And only Fosmatic gives you a visual numerical check of coordinate location plus operation sequence number.

Example of savings made with Fosmatic numerical control. The illustration (left) shows one half of a mold with 900 cavities, each of which requires nine operations—a total of 8100! Time for the entire job was 100.25 hours, 25% of time consumed previously on a conventional jig borer.

Write or call today for complete information on a numerically controlled jig borer or jig grinder to improve your production method.

PUNCHED CARDS

This system can be integrated with card systems already in use by your company. Each job is programmed in a "deck" of cards; provides great flexibility, since an operation can be added or eliminated simply by making a new card or removing an old one.

PUNCHED CARDS

Buy a Fosmatic today—add Numerical Control tomorrow

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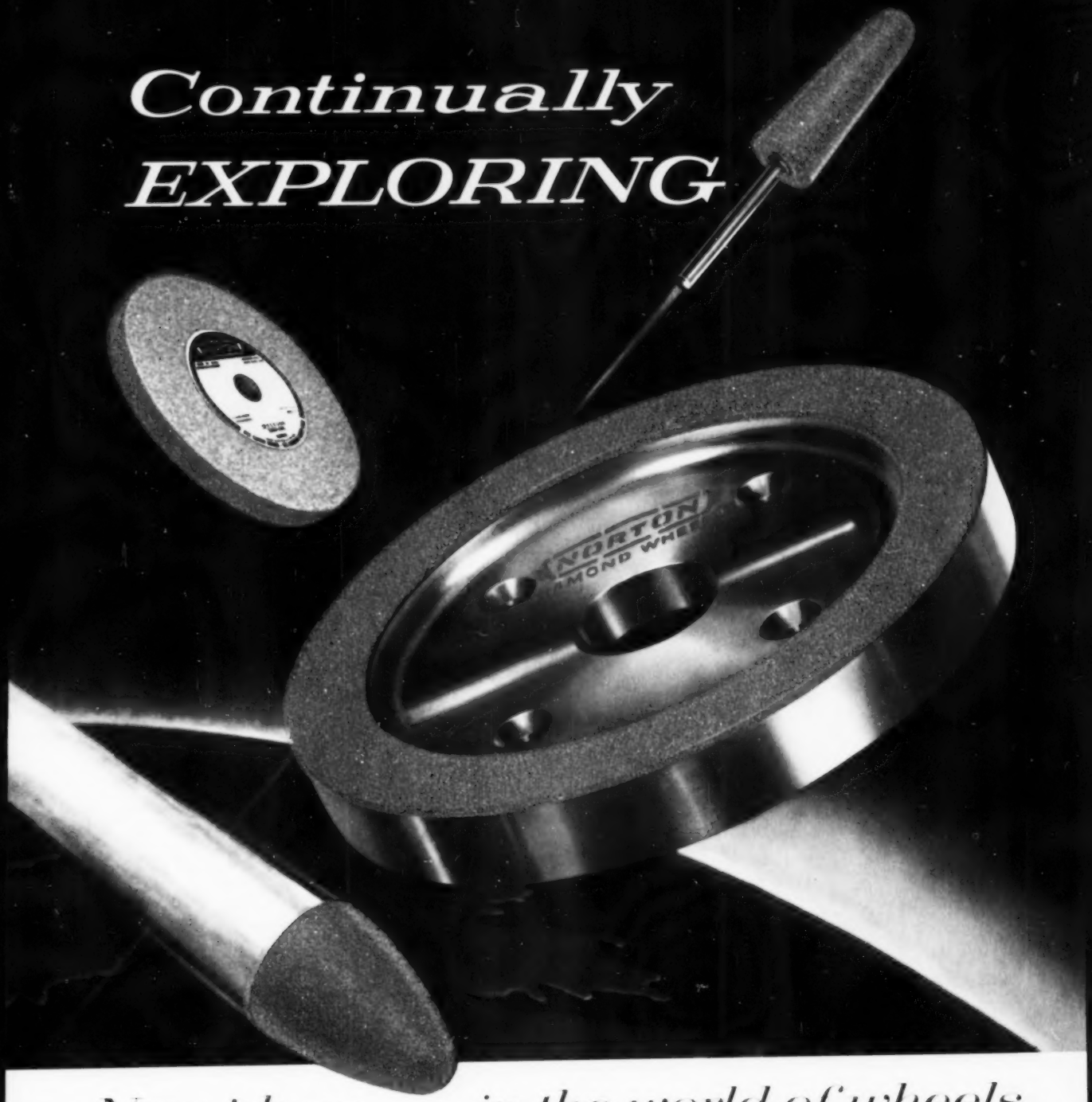
CIRCLE 198 READER SERVICE CARD

CIRCLE 199 READER SERVICE CARD ►

Continually EXPLORING



New ideas in the world of wheels

Norton abrasives are constantly reaching new heights of "Touch of Gold" performance, improving products and reducing grinding costs every time they go into action.

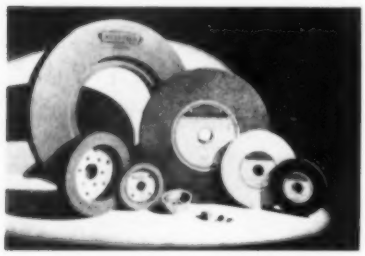
Call your Norton Man

After thorough training at the Norton plant, your Norton Man has had long practical experience as a consulting specialist on the widest range of grinding operations.

He'll give you expert advice on the selection, use and care of grinding wheels. He's ready to supervise complete wheel testing whenever necessary. And, if needed, he'll make a free Abrasive Requirement Study in your plant — listing the correct specifications for each abrasive job to assure you the lowest cost-per-piece ground.

HE'S BACKED BY . . .

The World's Most Complete Line. Norton abrasive products — grinding wheels, segments, bricks, sticks, mounted wheels, abrasive for barrel-finishing, grain for polishing and blasting — are designed to cover all abrasive operations, ranging from



heaviest stock removal to the most delicate precision finishing. Norton grinding wheels are made in exactly the right types and sizes to bring you the value-adding, cost-cutting "Touch of Gold."

Great New Discoveries. Over 190 Norton scientists and technicians, in many specialized laboratories, are using the latest equipment for research, development and testing of more efficient, more economical abrasives and abrasive products. Latest discoveries from this center of abrasive progress include 44 ALUNDUM

abrasive, three outstanding grinding wheel bonds — G, K and R50 — metal-mounting of mounted wheels, miniature mounted wheels and SD diamond wheels, using man-made diamonds.

Fastest Possible Deliveries. Besides immense factory stocks at Worcester and Santa Clara, California, Norton maintains huge warehouse stocks in five conveniently located cities. And Norton distributors, in 283 cities, keep their stocks fully adequate to meet the needs of their areas. For prompt deliveries — extra fast in emergencies — plus helpful service, your Norton distributor is as near as your phone.

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BEHR-MANNING CO., Troy, N.Y. is a Division of Norton Company

Making better products . . . to make your products better

NORTON PRODUCTS: Abrasives • Grinding Wheels • Grinding Machines • Refractories • Electro-Chemicals — BEHR-MANNING DIVISION: Coated Abrasives • Sharpening Stones • Pressure Sensitive Tapes

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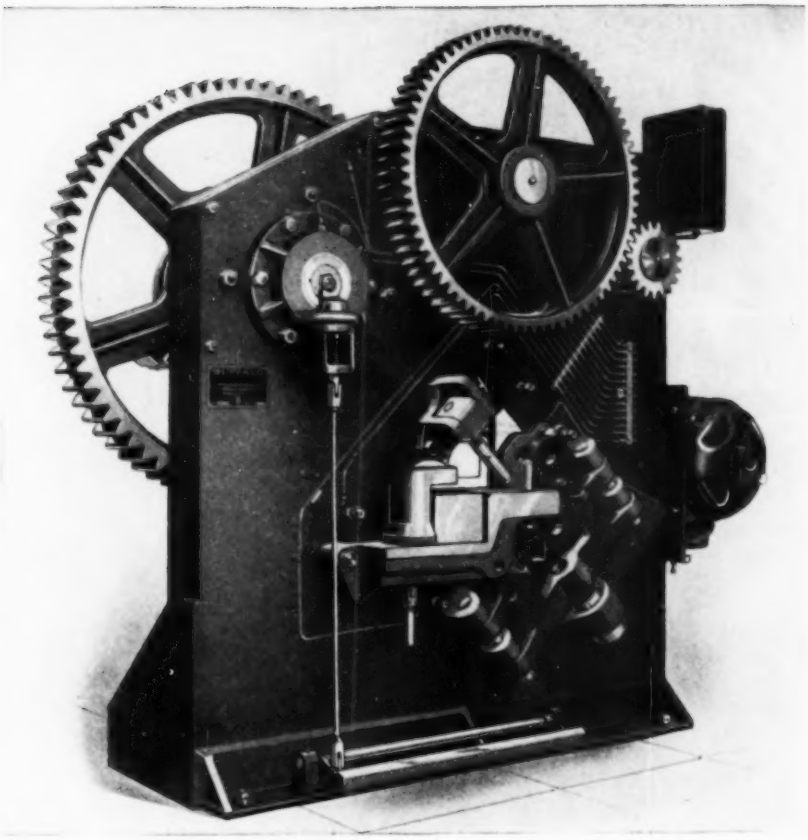

For *Faster* Cutting of

ROUNDS

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"BUFFALO" BAR CUTTERS CUT COSTS WHILE THEY CUT STOCK!

Here's How They Save You Dollars:

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3. "Buffalo" Bar Cutters are ruggedly built for maximum productive life with a minimum of maintenance costs. Electrically-welded steel plate frame insures great rigidity and dependability. All major components are of extra-heavy construction to resist wear. Dependable lubrication is provided by centralized oiling system.

"Buffalo" Bar Cutters are designed for fast, efficient production. Knife openings are generously-sized. This permits handling a wide range of sizes and shapes without frequent knife changes.

See how "Buffalo" Bar Cutters can cut costs for you. Contact your nearby "Buffalo" machine tool dealer, or send handy coupon.

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For Versatility and Adaptability

BULLARD Hydra-Feed Lathes

Rough forging of front axle spindle SAE #1037 Steel, Brinell Hardness 31-32 on the C scale.

The Senior Engineer at one of the leading motor car manufacturers in Detroit, was looking for a tracer lathe that went beyond his immediate requirement and offered easy conversion to other uses in years to come, to give longest tool life, to do the job with a minimum of shutdown time, to handle future developments in the realm of cutting tools, to reduce scrap to a minimum.

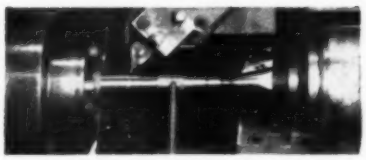
The answer to this multiple problem, according to the Senior Engineer was "BULLARD HYDRA-FEED TRACER LATHES."

We invite you to investigate the advantages which Bullard Hydra-Feed Lathes, either tracer or multiple tool models, offer you. Phone or write your nearest Bullard Sales Office, Distributor or

THE BULLARD COMPANY

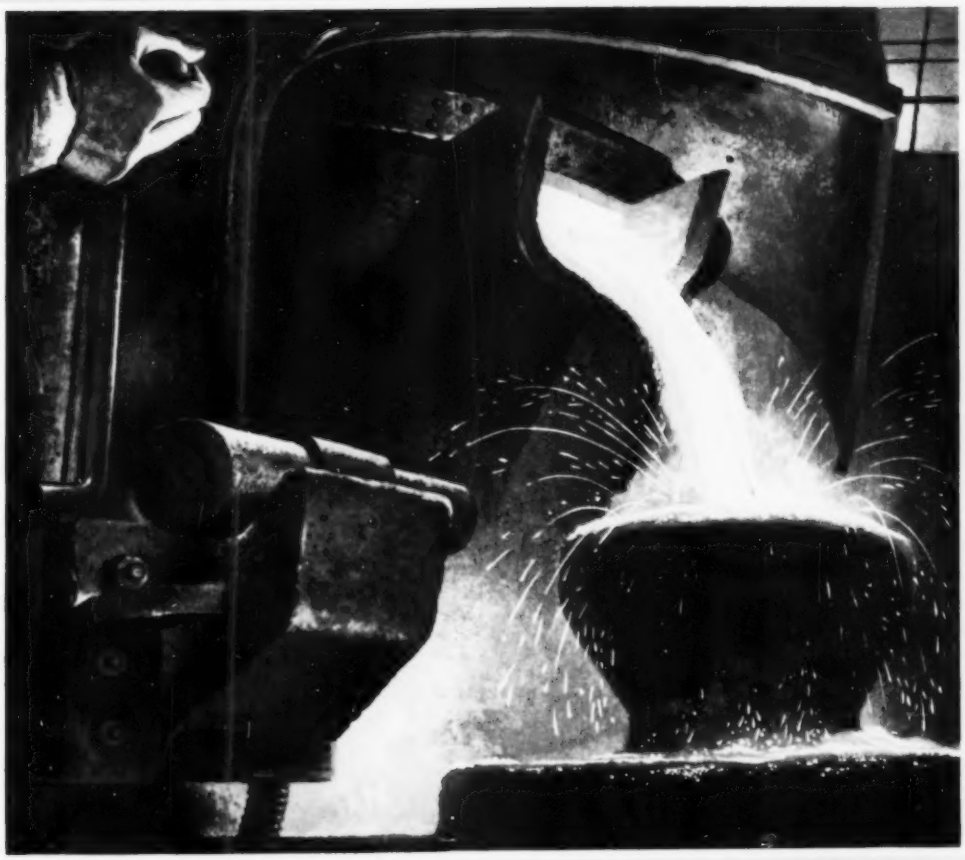
BRIDGEPORT 9, CONNECTICUT

Rough turning with Rear Tracer Slide.



Finish turning with Right-Hand Top Tracer Slide

Finished piece complete cycle time — 65 seconds.



Melting furnace at Calumet & Hecla, Inc.—Wolverine Division, where Shell Irus Fluid 902 eliminates the danger of hydraulic line fires.

Ready... aim... NO FIRE!

Take 10 high-temperature alloy-melting furnaces, hydraulically operated—each pouring 1500 lbs. of molten metal every hour in close proximity to "live" hydraulic lines—and you can readily see why selection of hydraulic fluids is important to Calumet & Hecla's Wolverine Tube Division.

Now the operation is made more reliable by the use of Shell Irus Fluid 902, a water-in-oil emulsion type fluid. Irus* Fluid was C & H's choice, after carefully studying other commercial hydraulic fluids—for many reasons:

1. Irus Fluid will not support combustion.
2. Irus Fluid has excellent lubricating properties.
3. Irus Fluid has hydraulic efficiency and equipment compatibility.
4. Irus Fluid is economical, costing about one-third less than other fire-resistant fluids.
5. Irus Fluid's bright yellow color makes it easy to spot and trace leaks.

In plant after plant, operators find that these advantages assure maximum safety to both personnel and equipment.

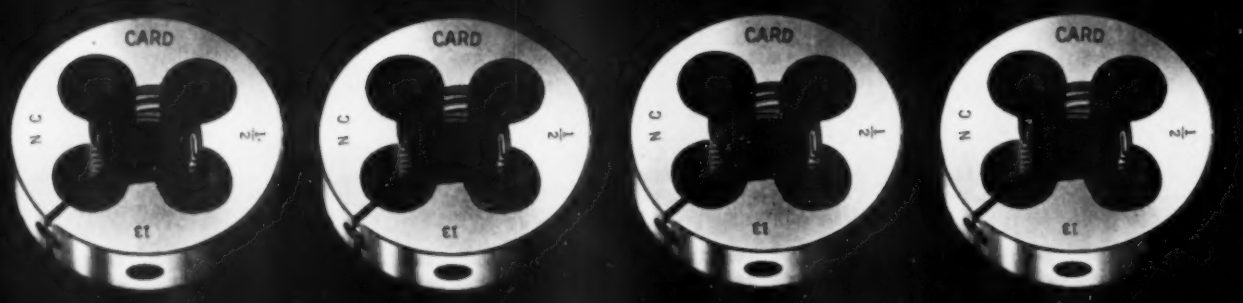
If you have a hydraulic line fire hazard, we suggest that you have the Shell Industrial Products Representative show you the many advantages in Irus Fluid 902; or write to Shell Oil Company, 50 W. 50th St., New York 20, N. Y., or 100 Bush St., San Francisco 6, Calif. In Canada: Shell Oil Company of Canada, Ltd., 505 University Ave., Toronto 2, Ontario.

SHELL IRUS FLUID 902

the low-cost, fire-resistant hydraulic fluid

SHELL

When you see uniformity, remember . . .



With Card dies you get uniformity

Your production's consistent ...because Card dies are uniform

. . . And every one is backed by Card Division's *process inspection*. This thorough inspection system starts with the bar stock and is carried through each succeeding step of production . . . machining . . . heat treating . . . finishing. Every dimension is critically checked by men and machines. You get dies that are uniform . . . tools that you can depend on to do their jobs efficiently . . . economically. Your Card technical man has full details on how the high precision of Card dies can improve *your* production picture. S. W. CARD DIVISION, Mansfield, Mass. Card Warehouses: Atlanta, Chicago, Detroit, Fort Worth, Los Angeles, New York, San Francisco.

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DIVISION OF UNION TWIST DRILL COMPANY

— Serving you through the best distributors from Coast to Coast

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If you use carbide tools as much as airplanes use instruments . . .

Ordering Union carbide tools will cut your production time and costs

The more you use carbide tools the more you need Union

Union's continual development of new carbide tools for new purposes has resulted in a complete line of these modern tools — complete in variety, versatility and cutting abilities. Backing this broad line is nationwide service that will benefit you. A Union technical man will be glad to show you how to cut your production time and costs with Union carbide tools — or any other Union tools, including drills, end mills, reamers, hobs, inserted blade cutters and milling cutters. **Available nationally through Union Distributors** and stocked in Union warehouses in Atlanta, Chicago, Detroit, Fort Worth, Los Angeles, New York City and San Francisco.

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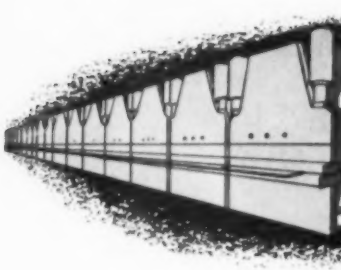
CIRCLE 205 READER SERVICE CARD



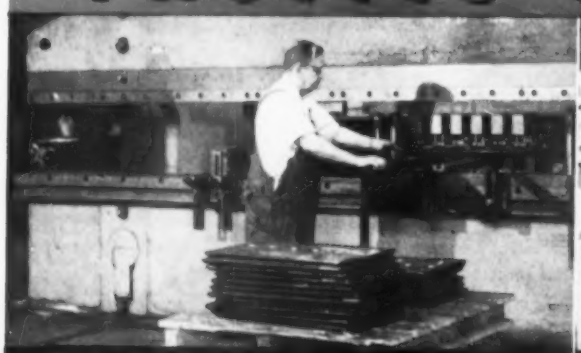
4,769 years to arrive ACCURATE HYDRAULIC

122 out of 124 hydraulic press brakes in U.S. aircraft industry are PACIFIC

Aircraft manufacturers work to the closest tolerances of all industries in metal forming. Douglas Aircraft Company, Tulsa, Oklahoma, with 8 Pacific Brakes (above) is typical of the airframe manufacturers who have selected Pacific for its precise accuracy.

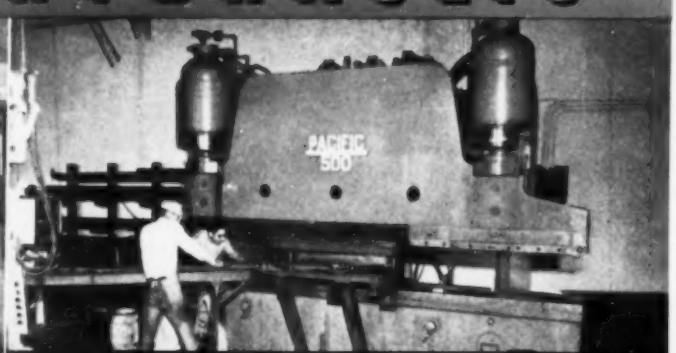
924 PACIFIC Brakes, representing over 95% of all hydraulic press brakes in use today, have operated for an aggregate of 4,769 years to test and confirm PACIFIC designs that have established hydraulic press brakes as far more profitable to operate than mechanical brakes. However, only PACIFIC has precise accuracy, versatility, high speed and dependability that comes from years of experience in manufacturing, developing and improving this unique machine. It is the only hydraulic press brake in daily operation that is actually air bending, straightening, deep drawing, blanking, and doing heavy punching. Accuracy within thousandths of an inch (greater than with any mechanical or other hydraulic brake) repeats itself on every stroke. Ram remains level regardless of location of work on the bed. PACIFIC sizes range from 60 tons to 1500 tons.

PACIFIC HYDRAULIC



Only hydraulic brake built for HEAVY PUNCHING

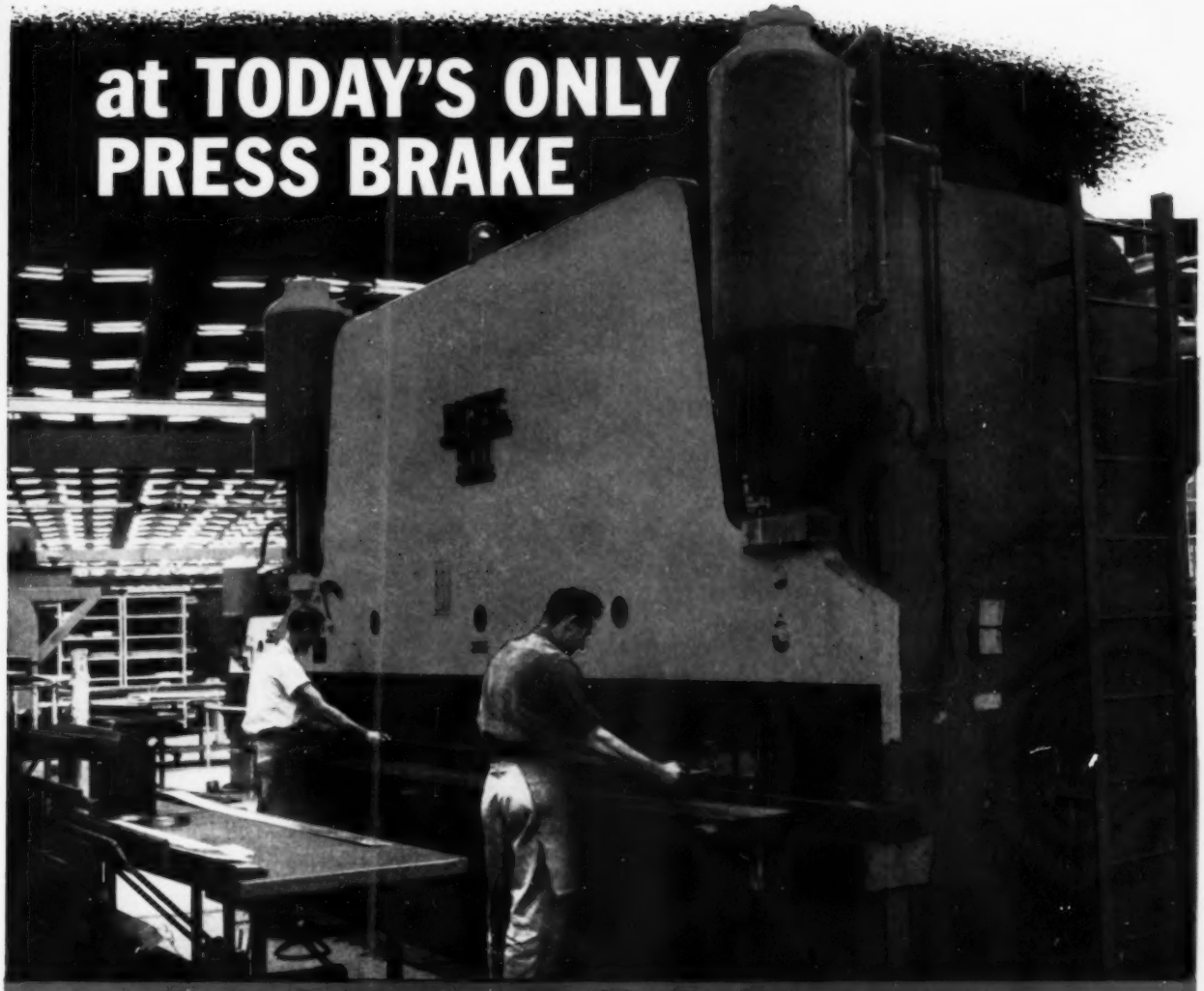
Pacific is uniquely designed to absorb heavy shock from punching in the hydraulic system rather than in the frame of the brake. Cushioned against shock, punch and dies stand up from 3 to 8 times longer than with mechanical brakes. Photo (above) shows 1" alloy steel plate being punched at earthmoving equipment plant.



MAINTENANCE-FREE for years

Dependable, simplified electrical and hydraulic controls can easily be kept working continuously by any plant maintenance crew. There are no complicated electronic devices. In photo (above) at agricultural equipment plant, the 500 ton Pacific Hydraulic Brake shearing ¾" alloy steel plate with Pacific Shearing Attachment has operated continuously for the first 4 years at a cost of $5.22 in replacement parts.

at TODAY'S ONLY PRESS BRAKE



PRESS BRAKE

HIGH SPEED operation

Pacific adjustable stroke length can be shortened for rapid stroking. Automatic, self-leveling ram permits use of progressive dies across entire bed of press. The automatically-fed Pacific at automotive parts plant, which can cycle up to seventy 1½" strokes per minute, is forming 3780 operations per hour in the above photo. In virtually any operation, Pacific's high cycling speed equals or exceeds materials handling capacity.

Write for brochure

PACIFIC INDUSTRIAL MANUFACTURING COMPANY

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LeBlond customers report:

New REGAL lathe design

Recommended by machine shop operators

it is the best lathe I have found in 35 yrs. experience

Best Tool Room lathe I have used in the past 14 years, also Best Lathe for the money.

I liked the looks and the Rigidity.

P.S. I also have another one on order.

more for my money.

scores high with operators

"Satisfied" or "well pleased" report 95% of new Regal operators! Source of these figures is the LeBlond Use-Check Questionnaire, which we send to all new LeBlond lathe owners—a direct method of learning what industry wants, needs, likes (or dislikes) in its lathes. Actually, the new Regal Lathe is designed largely around suggestions and ideas expressed by our customers in Use-Check Questionnaires of recent years.

What do the owners say about the new Regal?

Best-liked Regal features proved to be hardened bedways, electric brake and the speed range. 73% of the new Regals are being used in the toolroom or on the production line. Here's how some of the other questions and answers ran:

Q. "*Is production rate what you expected?*"
A. "Satisfactory or better" (96%).
Q. "*accuracy?*"
A. "Satisfactory or better" (97%).
Q. "*finish?*"
A. "Satisfactory or better" (96%).
Q. "*convenience?*"
A. "Satisfactory or better" (93%).
Q. "*Why did you select a LeBlond?*"
A. "Best dollar value." "Previous experience" (two biggest reasons).

At left are some of our customers' comments in their own handwriting.

The reason for this overwhelming acceptance of the new LeBlond Regal can be summed up very simply. It is what industry has been asking for—performance-wise, feature-wise, price-wise. Your LeBlond Distributor will give you all the details. Call him today, or write.

. . . cut with confidence

LEBLOND of Cincinnati

THE R. K. LEBLOND MACHINE TOOL COMPANY
Cincinnati 8, Ohio

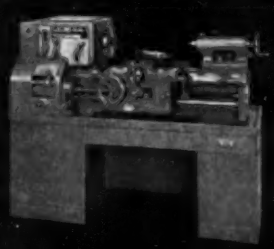
Designed and built like heavy-duty lathes, the new LeBlond Regals will give you a long life of precision production, minimum maintenance and the kind of dependability you'd expect from a much higher-priced machine!

13" and 16" Regals

The new Regal headstock uses the same combination gear-belt drive construction that proved itself on the famous LeBlond Dual-Drive and is now incorporated on our new 16" heavy-duty lathe. The new bed has hardened and ground replaceable steel ways like the ways on our heavy-duty machines. They are fitted according to the compensating veeway principle to insure better distribution of forces for proven long-time accuracy and minimum wear.

13" and 16" Regals

Again, like higher-priced lathes, Regals are equipped with both feed rod and leadscrew for continued accuracy in thread chasing. Other big-lathe features — 3-bearing spindle. Automatically-lubricated quick-change box. Wide carriage bridge with ample bearing surface. Rugged tailstock with plug clamping. Plus general dimensions and construction details patterned after LeBlond heavy-duty lathes.

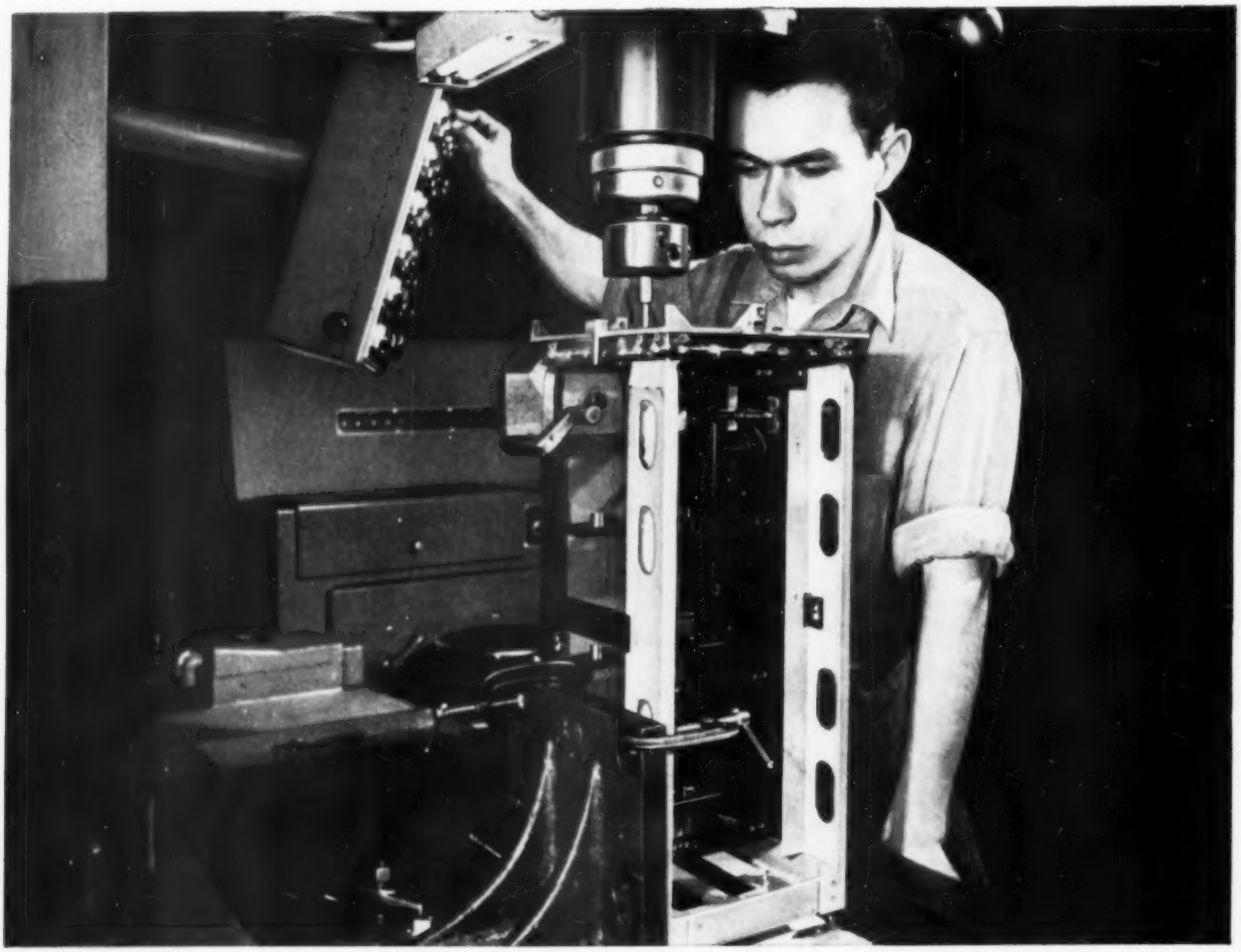


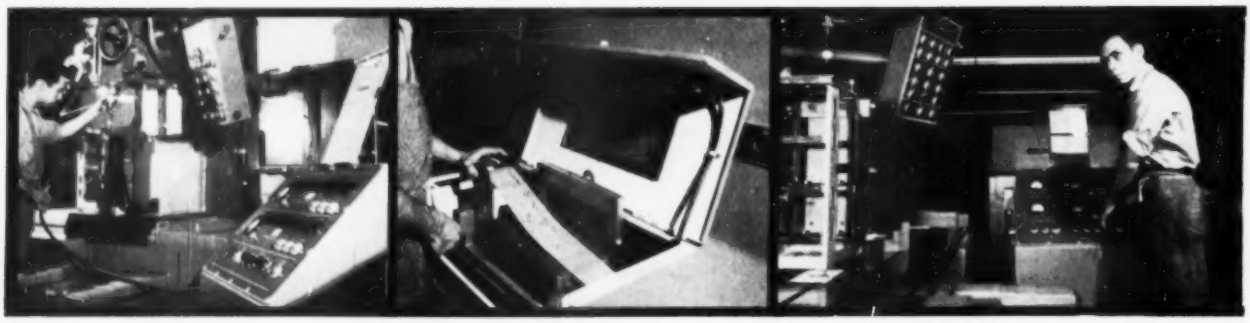
13" Regal Bench Model

All of LeBlond's 70 years of experience has gone into the design and building of these new Regals. Only from the builder of a complete line of lathes can you get a low-priced lathe with big-lathe features.

World's Largest Builder of A Complete Line of Lathes for More Than 70 Years

ACCURACY





BETTER WORK IS DONE FASTER... because the work is positioned automatically, leaving the operator free to concentrate on the cutting action and the quality of his work.

HUMAN ERRORS ARE ELIMINATED... since all positioning data is fed into the machine by this easily prepared punched tape. There's no chance to mis-read or mis-set dials or verniers.

EASILY SET DIALS... are provided to permit fast, accurate manual positioning of the machine for simple workpieces and other similar jobs where use of the punched tape is not desired.

CIRCLE 210 READER SERVICE CARD

ASSURED...

...AND MACHINING TIME **CUT IN HALF** WITH PRATT & WHITNEY NUMERICAL CONTROL

A specialist in ultra-precision machining, the Liverpool Machine Tool Company Inc., of Brooklyn, N.Y., employs about 50 people and handles subcontract work for many nationally known manufacturers. All work must be held to extremely close tolerances. To give its customers "something better and faster," Liverpool purchased a Pratt & Whitney Jig Borer with Numerical Control a year ago, "... a huge investment for a plant of our size." The company now reports that most jobs on the P&W Numerically Controlled Jig Borer are done in *half the time* that would be required under manual operation. Production costs have dropped correspondingly, and lower rates for precision work have resulted in many new customers and much profitable new business.

The greatly increased machine utilization made possible by P&W Numerical Control assures that the machine is kept busy at all times; operation is so easy and economical that it can be used efficiently for a very wide range of jobs ... including much work previously handled on drill presses and many small parts once made largely by hand. Since increased business has meant more money for everyone, employees throughout the Liverpool plant are enthusiastic about Numerical Control.

In the past, small and medium sized plants have believed that Numerical Control was too expensive to permit investment. However, Liverpool's experience proves conclusively that no plant of *any* size can afford to overlook the business- and profit-building power of Numerical Control. It will pay *you* to find out the facts, so write today for Circular No. 609. Pratt & Whitney Company, Inc., 11 Charter Oak Blvd., West Hartford, Conn.

PRATT & WHITNEY

FIRST CHOICE FOR ACCURACY

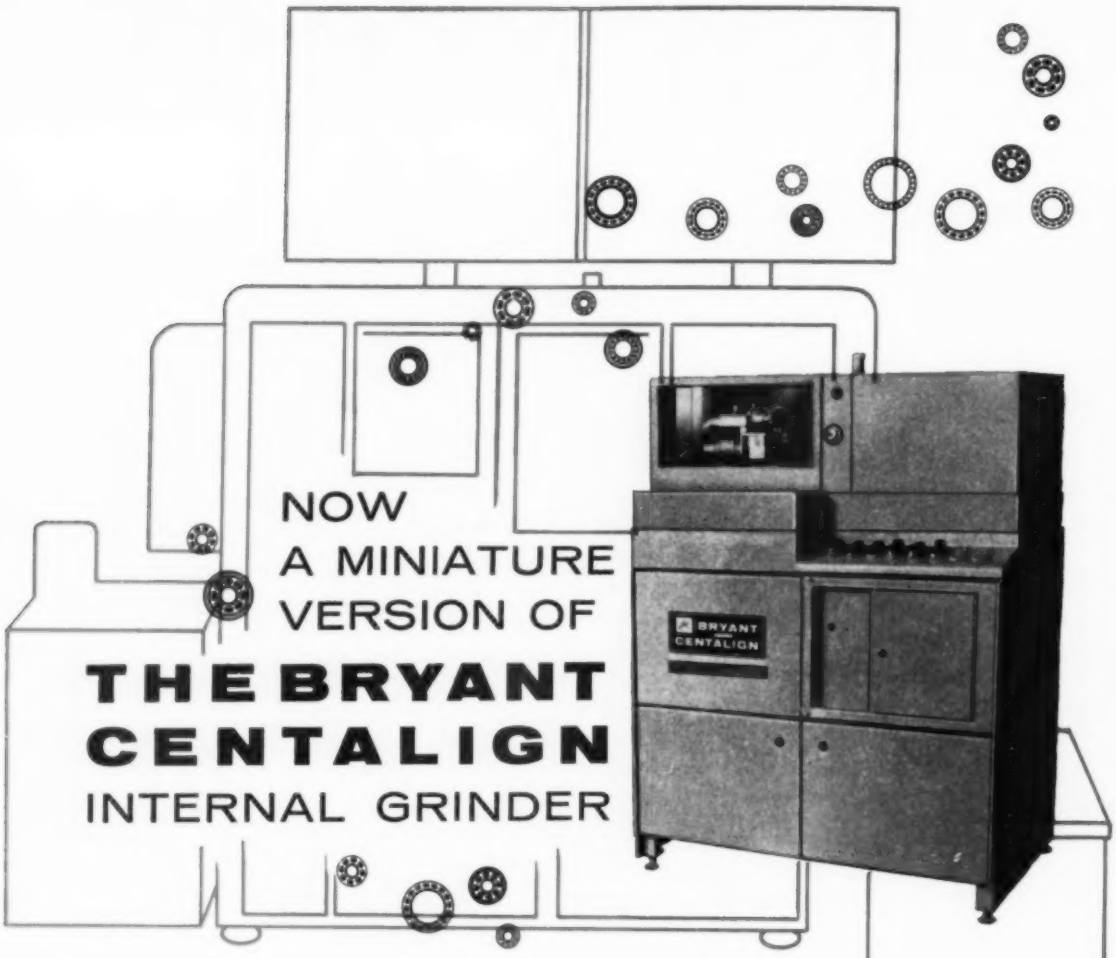
MACHINE TOOLS • GAGES • CUTTING TOOLS

AUTOMATICALLY POSITIONING WORK ACCURATE TO .0001" ... the P&W Numerically Controlled Jig Borer combines toolroom precision with production-line speed, economy.

SETTINGS ACCURATE TO 5 SECONDS OF ARC ... are made automatically by the P&W Rotary Table with Numerical Control. Speeds work, eliminates human errors.

PROFILE MILLING ENTIRELY UNDER TAPE CONTROL ... the numerically controlled P&W Numeric-Keller produces irregular shapes without the need for any template or model.

CIRCLE 211 READER SERVICE CARD



NOW A MINIATURE VERSION OF THE BRYANT CENTALIGN INTERNAL GRINDER

Specifically designed to give greater accuracy, speed and flexibility in the production of miniature bearings

The Bryant Miniature Centalign Model B brings new efficiency and accuracy to the grinding of bores and internal ball tracks in miniature and instrument bearing races. This new grinder is extremely compact, requiring only 8¼ square feet of floor space — half the space required by machines currently in use.

The exclusive Bryant feature of interchangeable "packaged tooling" allows set-up away from the machine, and results in almost uninterrupted machine production. Long periods of downtime usually required to retool for work part changes are eliminated.

Other time — and — money saving features include:
**Automatic New Wheel Dressing* — New wheels automatically dressed to correct size for maximum wheel life.
**Selective Skip Dressing* — Flexibility in cycling to suit job requirements.

Here is the answer to demands for faster, more accurate bearing production! Write now for complete details.

BRYANT Chucking Grinder Co.

10 CLINTON STREET, SPRINGFIELD, VERMONT

Offices: Chicago • Syracuse • Cleveland • Indianapolis • Detroit • Springfield, N. J. • Los Angeles

MEET MRS. PETER PEFF

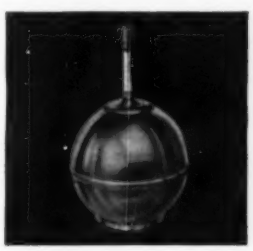
...and her company's new lightweight liquid-oxygen "vacuum bottle" for jet planes

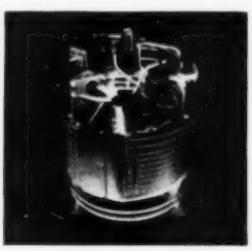
Mrs. Peff, president, Superior Air Products, Newark, N. J., with Supairco's recently developed liquid-oxygen "vacuum bottle."

MANY a tough problem has been solved by Mrs. Peff and her company since 1952, when she assumed the presidency after her husband's death. Specialists in building low-temperature apparatus and complete plants to produce oxygen and other gases, "Supairco" was asked recently to develop a light, compact container to supply oxygen for aircraft crews at high altitudes.

Ingenious design utilizing the broad and varied properties available in copper and its alloys produced the "vacuum bottle" shown above. The inner sphere is of Everdur®, Anaconda copper-silicon alloy, which has the workability and resistance to corrosion needed —and, more important, the strength and toughness to make possible a relatively thin, light shell that can withstand vibration and fatigue stresses aloft—plus shocks from catapult launchings and carrier landings. The outer shell is of Anaconda copper, highly polished to reflect heat. This, plus a vacuum under .001 microns between the spheres, holds liquid oxygen at −297 F.

Starting with over 100 standard copper alloys, Anaconda can provide an almost unlimited number of combinations of useful properties. When new and unusual problems arise, use Anaconda technical specialists to help you select metals for your needs. Address the American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont. 5041





LEFT: Inside the copper shell in main illustration is this slightly smaller liquid-oxygen container made of Everdur, the metal that spins and machines readily, is easy to join by soldering, brazing, welding. **RIGHT:** Completed liquid-oxygen converter, built by Mine Safety Appliances Company, Pittsburgh, Pa., serves 8-man crew. It is one-third the weight of the cylinder it replaces, takes much less space.

ANACONDA®

COPPER • BRASS • BRONZE
NICKEL SILVER MILL PRODUCTS
Made by The American Brass Company

Now...at no increase in price
40% more HP...longer service life
with Gates Vulco Ropes

Gates brings you, through *Specialized* Research in V-Belts, another important cost-saving advance:

Now — at no increase in price — the horsepower rating of Gates Vulco Ropes has been increased 40%.

As replacements on standard drives, these V-Belts with 40% more load carrying ability will give longer service. Longer life reduces down-time, and cuts belt replacement costs.

And as the tag tells you: Belts labeled "Gates Vulco Rope" or "Gates Hi-Power" are identical in construction and can be used interchangeably in matched sets.

Available Now
from your nearby Gates Distributor

Today, all Vulco Ropes in Gates distributor and warehouse stocks have the new higher horsepower rating.

See the Yellow Pages of your phone book for your nearest Gates V-Belt distributor.

Designing NEW Drives?

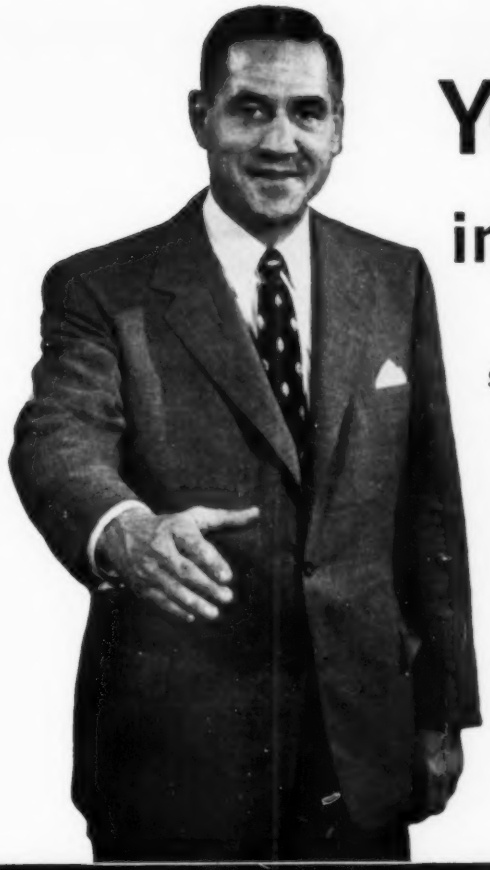
For new drives, Gates now offers you the *new Super HC V-Belts and Sheaves* — the most advanced concept in power transmission in 25 years. The Super HC Drive is far more compact... takes up to 50% less space. Costs less, too. You save as much as 20% over present V-Belt drives. Ask your nearby Gates distributor for Handbook DH-900 entitled, "The Modern Way to Design V-Belt Drives."

The Gates Rubber Company Denver, Colorado
Gates Rubber of Canada Ltd., Brantford, Ontario

Gates
World's Largest Maker of V-Belts

TPA-412

Gates VULCO ROPE Hi-Power V-Belts

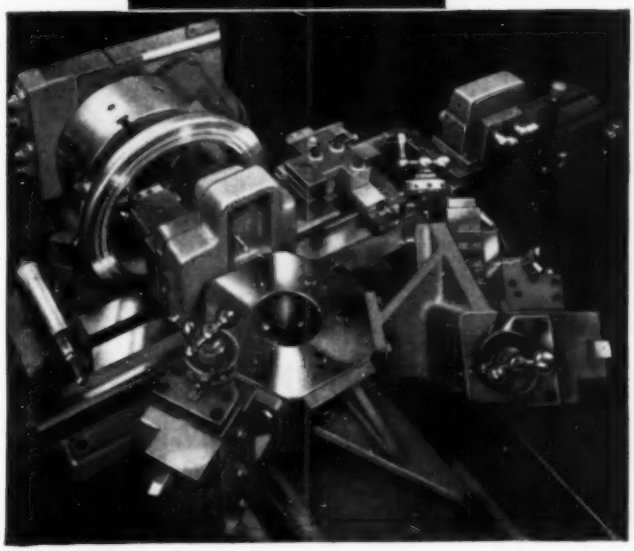


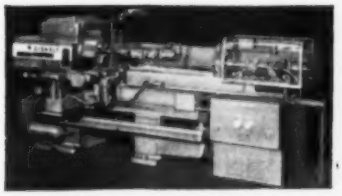
YOUR PARTNER in PRODUCTION

Your Gisholt Representative can save you time and help you make more money. Call him when you make your next estimate.

Got a new job coming up? Are you sure you're down to rock-bottom costs? Using the smartest setup? Combining all possible operations? Making the most of new accessories and machine features?

Your Gisholt Representative can tell you. He's an authority on the newest tooling methods and production techniques. He's a member of the Gisholt "Round Table"—a staff of specialists in machining problems who have helped hundreds of manufacturers find ways to lower costs. He's ready to help *you*—without cost or obligation. Call your Gisholt Representative today. Or write us.





A typical example of your Gisholt Representative's cost-cutting ideas

Above, a Gisholt MASTERLINE NO. 3 Ram Type Turret Lathe with hydraulic drive has become a rugged, low-cost automatic chucking lathe—but it still retains the versatility and quick setup of a hand-operated machine.

For example, the setup at left is handled by a female operator. Adjustable tooling permits machining 14 steel stamping sizes, $\frac{7}{8}$" to 2-15/32" width, $3\frac{3}{4}$" to $15\frac{3}{4}$" diameter, with minimum change-over. In one automatic cycle a typical part, $15\frac{1}{4}$" diameter, is completely machined (14 surfaces) in just 3.30 minutes f.t.f. With minimum investment, the new ram type lathe with hydraulic drive lowered production costs and provided automatic chucking turret lathe efficiency.

For complete information on the Hydraulic Drive, ask your Gisholt Representative or write for Form 1182.

GISHOLT

The Gisholt "Round Table" represents the collective experience of specialists in the machining, surface finishing and balancing of round and partly round parts. Your problems are welcomed here.

GISHOLT MACHINE COMPANY

Madison 10, Wisconsin

Investigate Gisholt's Extended Payment and Leasing Plans

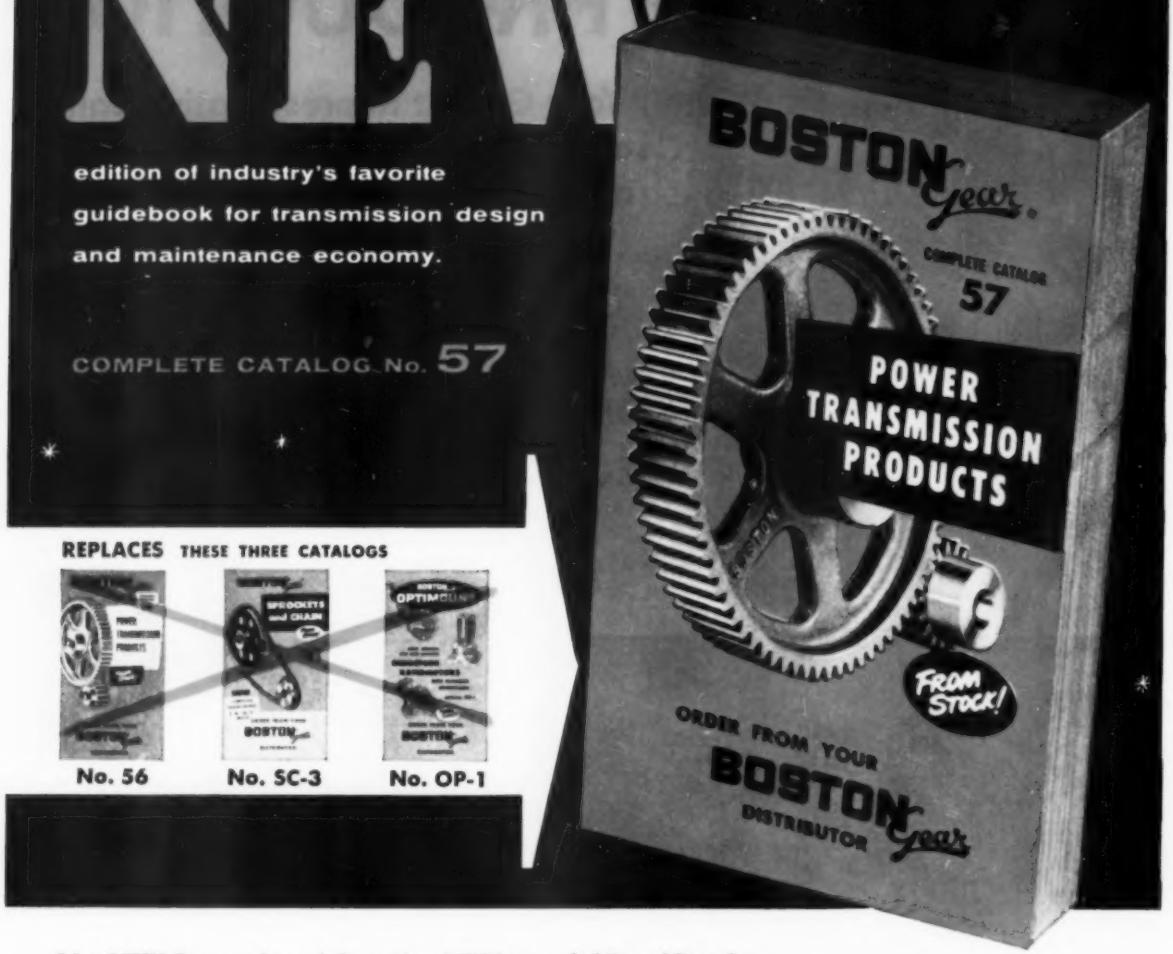
Turret Lathes • Automatic Lathes • Balancers • Superfinishers • Threading Machines • *Factory-Rebuilt Machines with New-Machine Guarantee*

NOW READY . . . the

NEW

edition of industry's favorite guidebook for transmission design and maintenance economy.

COMPLETE CATALOG No. 57



REPLACES THESE THREE CATALOGS

No. 56

No. SC-3

No. OP-1

Lists NEW Gears and gear information. NEW expanded line of Sprockets and Chain for any drive ¼" to 2" pitch. NEW OPTIMOUNT helical geared Speed Reducers, shaft mounted and base mounted. NEW types and sizes in every product line. 664 pages, with 58 pages of improved selection charts and engineering information to help you simplify transmission planning. Boston Gear Works, 60 Hayward St., Quincy 71, Mass.

YOUR COPY IS NOW AVAILABLE FROM . . .

YOUR NEARBY **BOSTON Gear** DISTRIBUTOR

STANDARDIZATION PAYS

***NOW* 9496**

STANDARDIZED POWER TRANSMISSION PRODUCTS

Stock Gears • Sprockets and Chain
Speed Reducers • Bearings
Pillow Blocks • Shaft Supports
Couplings • Pulleys

FROM STOCK!

For nearest Distributor LOOK UNDER "GEARS" in the 'Yellow Pages'

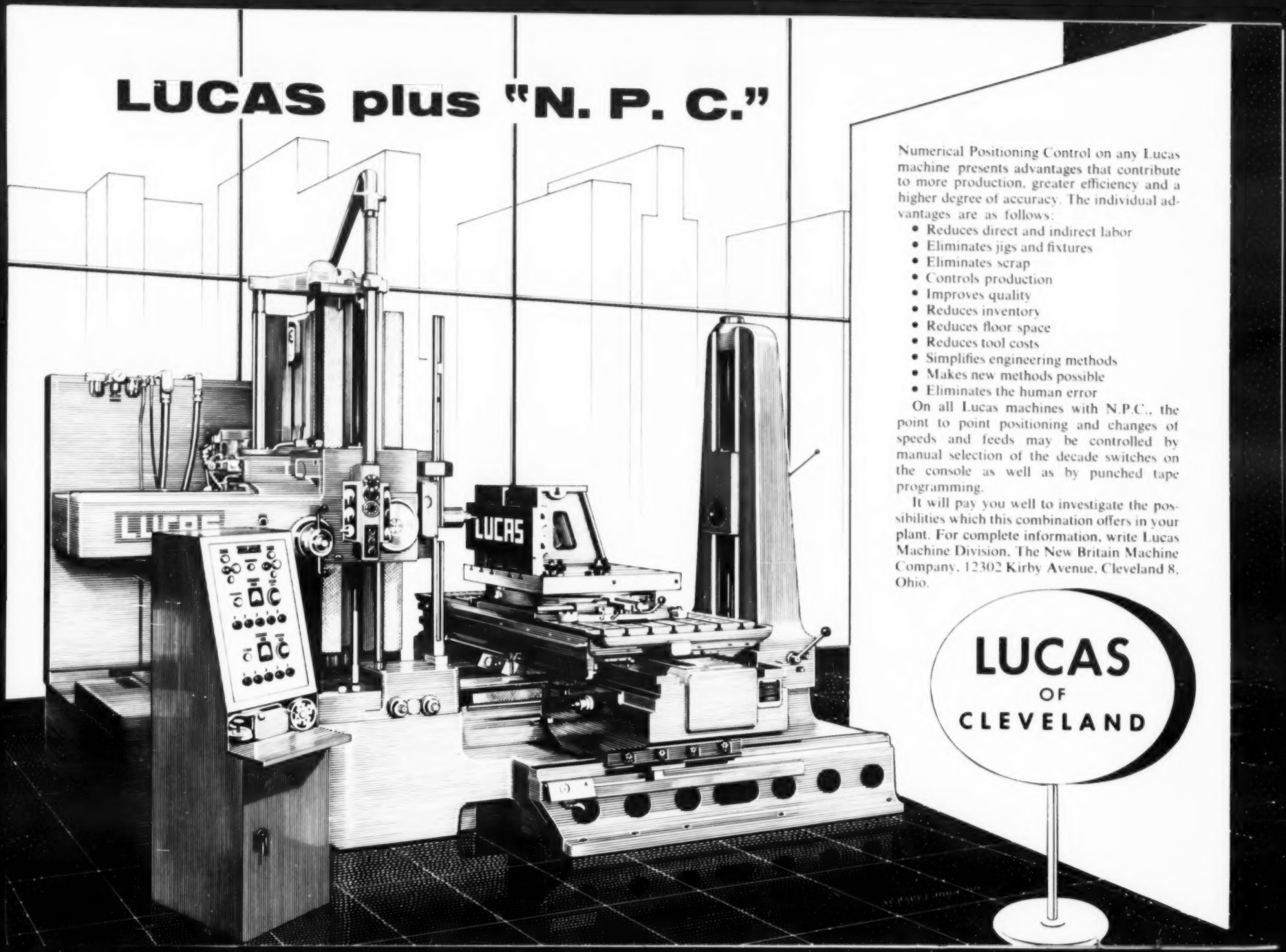
Advt. copyright by Boston Gear Works

newest and smallest in a distinguished line

LUCAS OF CLEVELAND

The new Lucas Horizontal Boring, Milling and Drilling Machine offers all the quality construction features of the other fine precision machines in the Lucas line plus a built-in Rotary Table. This versatile little machine is made-to-order for production of small dies, fixtures, miniature electronic parts, machine casings, aircraft and missile parts and similar work. The inherent accuracy of the Lucas 275-40-RT suits it for a variety of post-production inspection operations. Air Lift to saddle and table. Constant-operating automatic lubrication. Spindle diameter 2.750″ or 3.000″. Spindle travel 18″. Vertical Head travel 24″. Cross travel 30″. Longitudinal Saddle travel 18″. Table 26″ x 30″. Spindle speeds 62-2000 rpm. Feeds from .0007″-.915″. Tape programming can be added as an optional feature. For complete information, write Lucas Machine Division, The New Britain Machine Company, 12302 Kirby Avenue, Cleveland 8, Ohio.

LUCAS plus "N. P. C."



Numerical Positioning Control on any Lucas machine presents advantages that contribute to more production, greater efficiency and a higher degree of accuracy. The individual advantages are as follows:

- Reduces direct and indirect labor
- Eliminates jigs and fixtures
- Eliminates scrap
- Controls production
- Improves quality
- Reduces inventory
- Reduces floor space
- Reduces tool costs
- Simplifies engineering methods
- Makes new methods possible
- Eliminates the human error

On all Lucas machines with N.P.C., the point to point positioning and changes of speeds and feeds may be controlled by manual selection of the decade switches on the console as well as by punched tape programming.

It will pay you well to investigate the possibilities which this combination offers in your plant. For complete information, write Lucas Machine Division, The New Britain Machine Company, 12302 Kirby Avenue, Cleveland 8, Ohio.

LUCAS
OF
CLEVELAND

POSITIVE DUPLICATION – EVERY TIME!

From a given point, the needles of these compasses always point to the earth's magnetic poles . . . an important aid to exploration and navigation.

The (PD)° marking on these CINCINNATI Surface Grinding Wheels (and *all* CINCINNATI WHEELS) points to an important and remarkable quality . . . Positive Duplication, time after time after time.

CINCINNATI (PD) WHEELS do a better job for you, because 36 separate quality control steps in the unique (PD) process result in wheels of unsurpassed uniformity.

UNIFORMITY TO YOUR ADVANTAGE

Perhaps every wheel manufacturer has complained about the weather and its changing effects on the product. But Cincinnati has followed Mark Twain's advice and has done something about the weather.

Temperature and humidity of the Mold Room are controlled at exact, unchanging levels—every hour of every day *throughout the year!* In addition, (PD) vitrified wheels are fired in a tunnel in unvarying conditions of atmospheric control at critical sections within the kiln.

Result: Each of your re-order (PD) wheels will act and grind exactly like the original wheel.

CALL CINCINNATI

For experienced help in cutting costs, in grinding machine setups and operations, there are Cincinnati grinding specialists available to you. Call your CINCINNATI (PD) GRINDING WHEELS distributor, today, or contact Cincinnati Milling Products Division, Cincnnati 9, Ohio.

(PD) POSITIVE DUPLICATION

CINCINNATI®
GRINDING WHEELS

A PRODUCTION-PROVED PRODUCT OF THE CINCINNATI MILLING MACHINE CO.

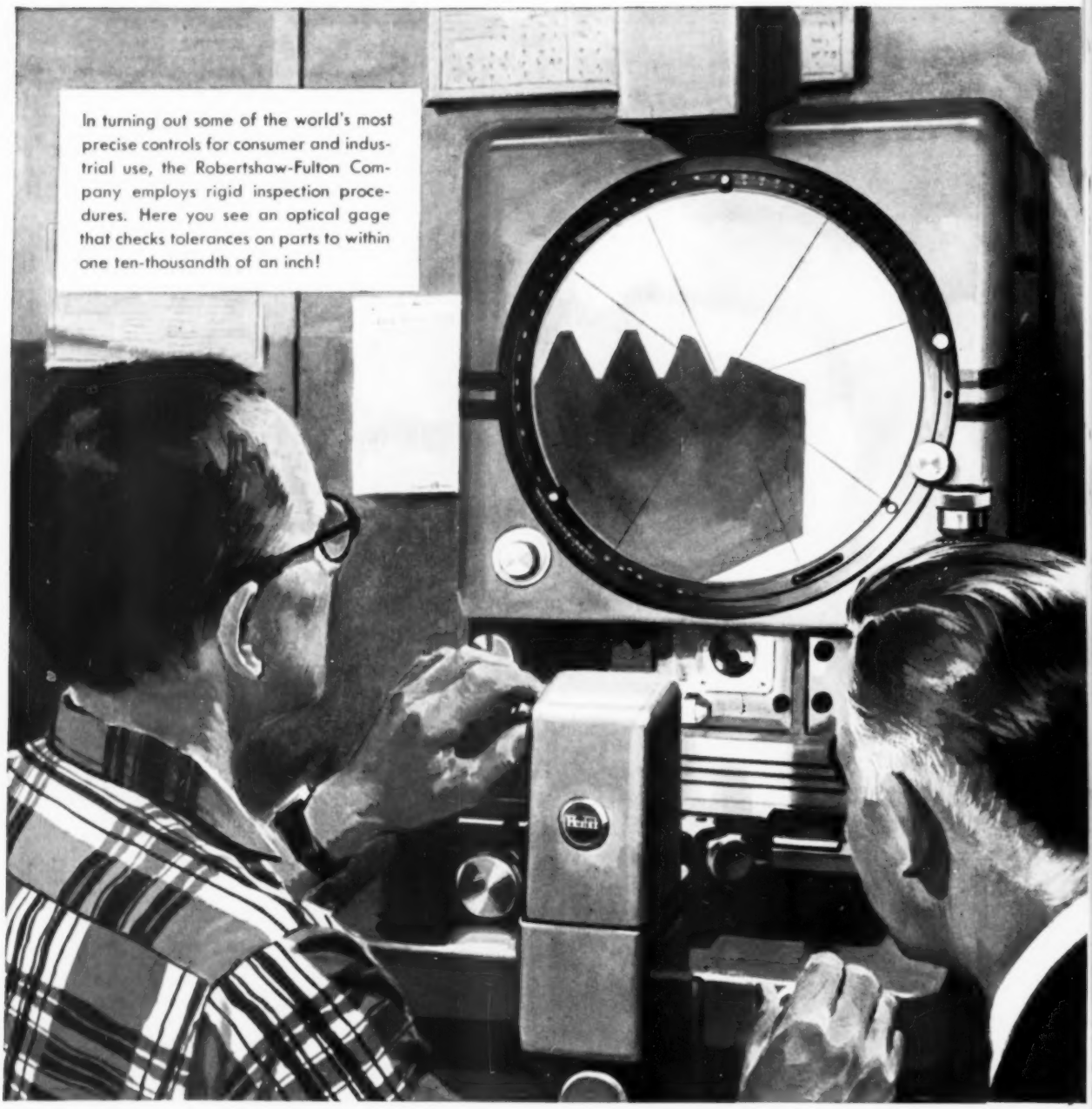
°Trade Mark Reg. U.S. Pat. Off.

◄ CIRCLE 218 READER SERVICE CARD

CIRCLE 219 READER SERVICE CARD

Correct Lubrication in Action...

How precision teamwork


In turning out some of the world's most precise controls for consumer and industrial use, the Robertshaw-Fulton Company employs rigid inspection procedures. Here you see an optical gage that checks tolerances on parts to within one ten-thousandth of an inch!

Mobil

Complete Engineering Program
Proved Petroleum Products

Mobil

cut costs- saved $12,532

Here's how Robertshaw-Fulton Controls Company and Mobil cut maintenance costs in numerous ways!

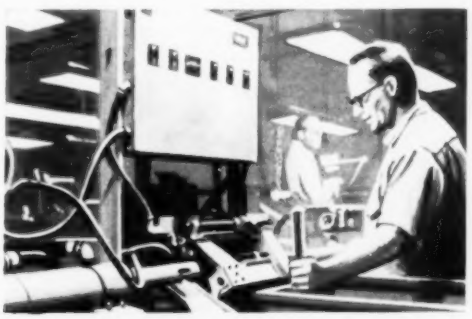
"Miracles with metals!" That's the description for the precision controls produced by the Fulton Sylphon Division of Robertshaw-Fulton Controls Company in Knoxville, Tenn. To turn out these finely engineered products takes the utmost coordination between machines and men. Here's where *Mobil Correct Lubrication* comes in.

Mobil engineers and plant maintenance personnel work as a team to solve maintenance problems and keep production at a maximum. For example: Bearing failures on controlled atmosphere furnace caused occasional shutdowns. Mobil engineers and plant supervisors developed a special automatic lubricating system that solved extreme temperature problems. Result: *no more bearing replacements* . . . in a year, *$2,700 saved.*

Here is just one of many examples of *Correct Lubrication in Action.* Imaginative engineering . . . research . . . laboratories on call . . . more lubricating experience than any other oil company back up a Mobil Program in a plant. Why not specify Mobil for your plant?

Turret lathe heads weren't indexing properly at times, resulting in losses on machined parts. Lathe had to be serviced several times a week. Mobil and plant men pinpointed trouble in soluble oil emulsion. New formulation solved problem . . . saved $2,000 a year in repair costs alone.

Previously, it required stopping machinery while a man brushed lubricant from a 35-lb. pail onto gears. Now with new pressurized Mobilcote S dispenser application is quick . . . no interruption to production . . . consumption of gear lubricant cut 95%. And a more thorough job is done too!



The four-way pilot valves on twenty-six hydraulic Corrugating Machines "froze" after shutdown over weekend . . . had to be disassembled and cleaned each time. Mobil analysis found trouble to be corrosion. Mobil recommendation eliminated trouble . . . saved $2,072 per year.

The thirteen Redraw Presses were eating up oil. Mobil and plant men devised system that included mechanical improvements . . . tightened hydraulic system . . . installed collecting pans and used portable oil filter. Result: 9,600 gallons of oil reclaimed . . . $5,760 saved annually.

Correct Lubrication

Another reason You're Miles Ahead with Mobil!

ARMSTRONG

Drop Forged CLAMPS

LEADERS IN THE DROP FORGED CLAMP FIELD

. . . in design, machining and strength; in completeness of line in both sizes and types.

Designs are based on a full knowledge of clamp uses and requisites. Drop forging assures die-perfect form, texture toughness and freedom from structural faults. Maximum stiffness is attained by a discerning selection of steels with accurate controlled heat-treating, tempering and testing.

For dependability and long useful life, specify and standardize on ARMSTRONG Drop Forged Clamps.

EXTRA DEEP THROAT "C" CLAMPS

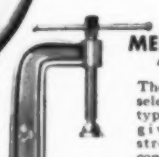
Provide extra clearance required for some work. Extremely stiff for weight. Screws and hubs are accurately machined and aligned with machined seats; have sliding pin handles and free-acting swivel caps on point. Bodies have smooth sandblast finish.
(8 sizes to 12" opening)

Write for new ARMSTRONG General Catalog showing almost 5000 industrial tools.

ARMSTRONG BROS. TOOL CO.
5215 W. ARMSTRONG AVE. • CHICAGO 46, U.S.A.

HEAVY DUTY "C" CLAMPS

Universally recognized as strongest "C" clamps made. Longer hub holds screw alignment against terrific side strain; permit tighter clamping and multiplies thread friction against loosening. Extra large screws are heat treated and hardened at point.
(11 sizes to 12½" opening)



MEDIUM SERVICE "C" CLAMPS

The design and careful selection of steels in this type clamp combine to give it maximum strength and stiffness consistent with convenient weight. Heat treated screw with sliding pin handle and swivel cap on point. Ground seat.
(9 sizes to 18" opening)

TOOL MAKERS "C" CLAMPS

Quality steels, drop forged, heat treated and accurately machined with ground seats. Drop forged screws have both "wing nut" handle for convenience and square necks for tight setting with a wrench. Either "plain" or "swivel" screw types.
(Four sizes: 1", 2", 3" or 4" maximum opening)

SPATTER RESISTANT WELDERS "C" CLAMPS

Extra Deep Throat Pattern (see above). Body, Swivel and Screw are cadmium plated over all to resist welding spatter.
(8 sizes Capacities to 12" opening)

MACHINISTS' CLAMPS

Jaws drop forged, carefully machined and hardened, are extra heavy; will not bend or spring on a short bite and are faced true. Will grip non-parallel surfaces because the under face of the center screw is convex, fitting into a concave seat for tilting.
(Four sizes: Capacities to 4¼" opening)

PARALLEL CLAMPS

Carefully machined from selected grade steel and hardened. Particularly suited for holding work together when drilling or tapping. Rounded jaw ends increase clearance in close quarters. Spring clip holds loose pin in alignment while tightening or loosening.
(3 sizes: Capacities to 2½" opening).

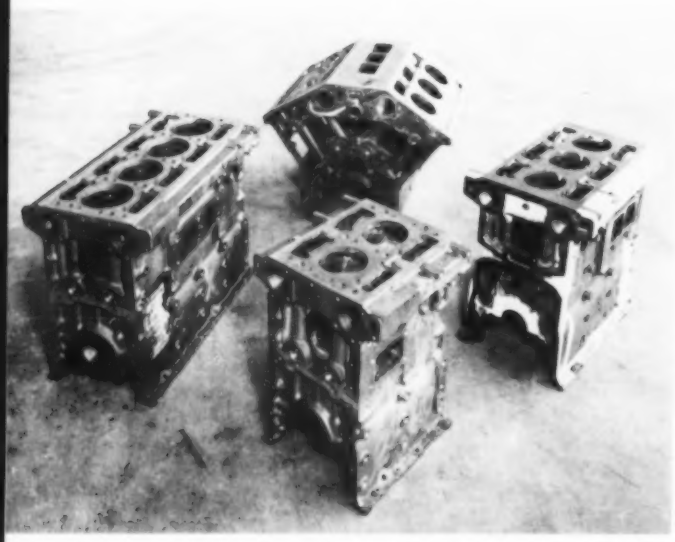
Tomorrow this transfer machine will work on a different part

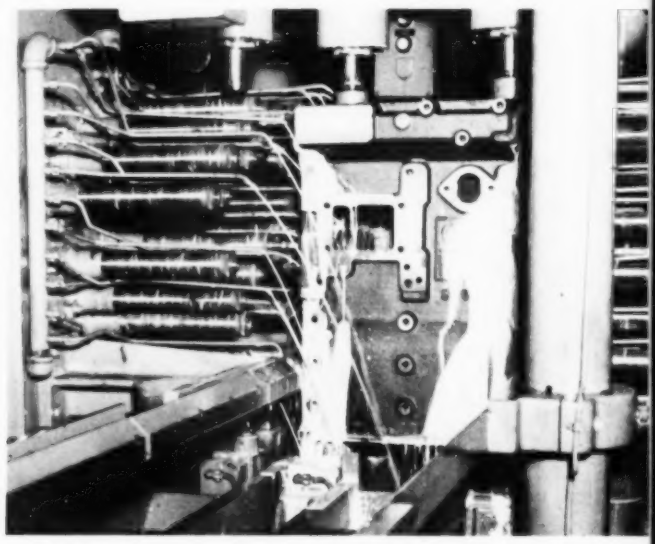
. . . Natco flexible automation can speed your production too.

(see other side)

FOUR PARTS OR ONE CAST IRON OR ALUMINUM

It's all the same to these Natco transfer machines





Look at these four diesel engine blocks. Each is a different machining problem, yet one line of three Natco Holeways does the complete job on them all.

Natco designing skill shows in the easy way these machines accept the four different blocks, either cast iron or aluminum. In only 40 working stations these machines can perform 485 operations. Ingenious transfer devices enable all faces of the workpiece to be machined. Versatile building block construction keeps the line ready for conversion when models change.

Natco Holeway No. 1 is capable of performing 173 different operations drilling, rough boring, reaming, chamfering and counterboring.

Holeway No. 2 does 139 similar operations, including end milling of these same engine blocks.

Holeway No. 3 performs 173 tapping operations. These machines work on all the external faces of the blocks, including the angular faces of the V-block.

Product mix problems? Think what a truly flexible Natco like this could do for them! Weigh the value of a Natco which accepts a variety of parts and decides what work to do on them. Even if your production won't justify this ultimate in automatic machining Natco builds drilling, boring, tapping, facing, reaming, chamfering machines in all degrees of automation.

Standard or special, if your machining job is holes, Natco makes the machine to do it better. Let our representative show you. Call him today.

NATCO NATIONAL AUTOMATIC TOOL COMPANY, INC., RICHMOND, IND.

Smaller Panels

WITH SQUARE D *"System-Designed"* RELAYS

CLASS 8501
TYPE DO-22

Write for Bulletin D.
Square D Company,
4041 North Richards Street, Milwaukee 12, Wisconsin

Square D relays are available for both AC and DC systems—with up to 10 contacts—in both electrically and mechanically held forms. Timing relays are also available in AC and DC versions—with timing intervals from 0.2 second to 3 minutes.

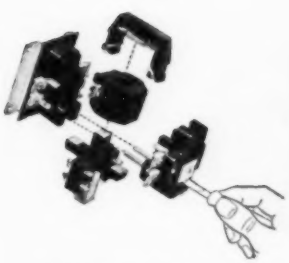
Both relays and timers give you these important advantages:

Require less panel space • Relays are only 3" wide, range in height from $3\frac{1}{4}$" to 5". Timers are just $2\frac{5}{8}$" x $4\frac{3}{16}$" or $2\frac{1}{2}$" x $7\frac{21}{32}$". Mechanically held relays require no extra panel space.

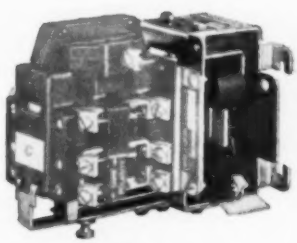
No mounting problems • All Type A timers and Type D relays have identical mounting hole dimensions.

Easy wiring • Choose either pressure wire connections or slip-on connectors for all terminals.

Long life • Balanced construction reduces wear on single moving part. Epoxy-resin molded coil operates cooler, virtually eliminates coil burnout.

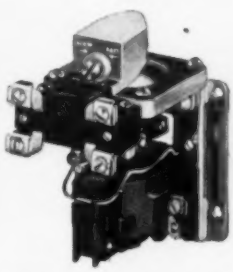


Disassembly from front in 20 seconds makes Square D Type D relays easiest to maintain



Convert any Square D Type D relay to mechanically held with easy-to-use attachment

DC relays have contact arrangements and mounting hole dimensions identical to AC



Timing relays convertible from on-delay to off-delay, using only a screwdriver

Square D offers the broadest line of relays, starters and accessories for all types of control systems

SQUARE D COMPANY

1ST The outstanding Type RCP Constant Potential Power Source for gas-shielded fully automatic and semi-automatic welding. Available in 500, 600 and 1000-amp ratings to suit every need. May be used with separate Dynamic Reactor.

2ND A complete 200-amp. Type RCC Constant Current Welding Power Source "package" for use with the popular WESTINGARC® SA-110 and SA-111 semi-automatic hand guns and control monitor. Converts to manual welding use at the flick of a switch.

NOW!

ANOTHER ADVANCEMENT TO EXTEND YOUR WELDING VERSATILITY

Westinghouse "RCV" Welding Power Source

WITH BUILT-IN DYNAMIC REACTOR

It's the NEW 200-amp, Type RCV Constant Potential Power Source for gas-shielded welding—specifically designed as the most important "companion" for the WEST-ING-ARC SA-120 and 121 hand gun and control monitor.

The RCV Power Source, with its built-in contactor and controls and built-in Dynamic Reactor, opens new fields for welding of light-gauge steels—mild and stainless—aluminum and magnesium. It permits all-position welding . . . reduced welding wire costs . . . improved "wash" and penetration over a broad range of applications and material thicknesses.

Contact your nearest Westinghouse welding distributor or welding sales engineer. Or write: Welding Division, Westinghouse Electric Corporation, Buffalo 5, New York. J-22001

Features:

• Primary circuit breaker with full over-current protection • Thermoguards® in each transformer winding for thermal protection • Single phase—230 volts. May be used where higher primary voltage is not available; reconnectable for 460 volts • Auxiliary transformer for 110 volts to supply control monitor • Built-in contactor—operated by trigger of SA-120 and 121 gun
• Built-in Dynamic Reactor • Bonderized finish
• Dead-front Cam-Lok cable terminals and plug connection
And many other user advantages!

$795 IN ZONE 1
Zones 2 and 3 slightly higher

YOU CAN BE SURE...IF IT'S Westinghouse

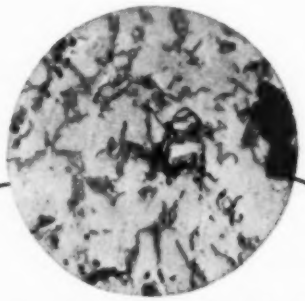
WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV MONDAYS

Watch Westinghouse for New Developments in Welding

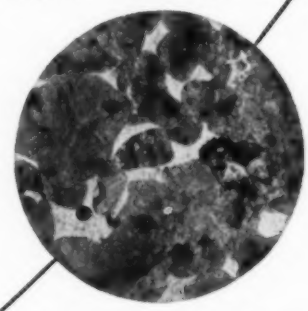
◀ CIRCLE 226 READER SERVICE CARD

CIRCLE 227 READER SERVICE CARD

Quality of GRAMIX® precision parts insured by metallurgical control in the laboratory *proven by performance on the job!*



Photomicrograph of a section of an inferior powder metallurgy part that has been improperly sintered. Structure is composed of cementite and ferrite.



Photomicrograph of an internally sound GRAMIX part shows the fine grain structure of tough, shock-resistant pearlite.

To assure the dependable performance of GRAMIX powder metallurgy parts in actual operation, the United States Graphite Company combines exacting laboratory tests and rigid production controls to insure the quality of every GRAMIX part. Through the use of the metallograph, for example, GRAMIX engineers can check the internal structure of a part. A comparison of the photomicrographs shown above readily shows the sound under-the-surface quality of a GRAMIX part as opposed to the poor internal composition of an improperly sintered part. In the photomicrograph at the top, notice the cementite between the ferrite grain boundaries. This cementite will tend to break up and rupture under shock. The surface of the material is decarburized and only remnants of pearlite remain. *This condition is due entirely to the lack of adequate sintering control!*

The photomicrograph of the GRAMIX part at the bottom shows a fine grain pearlite structure that's tough, strong and wear resisting. Absolute sintering control along with precise metallurgical control in the laboratory is utilized by The United States Graphite Company to positively assure quality GRAMIX parts.

PM PM MEMBER

Write today for these helpful engineering manuals. Engineering Bulletin No. 18 covers design and metallurgical requirements and alloy selection of GRAMIX bearings. No. 19 contains facts about GRAMIX Machine Parts and No. 21 contains general information on GRAMIX products from Powder Metallurgy. Get your copies now.

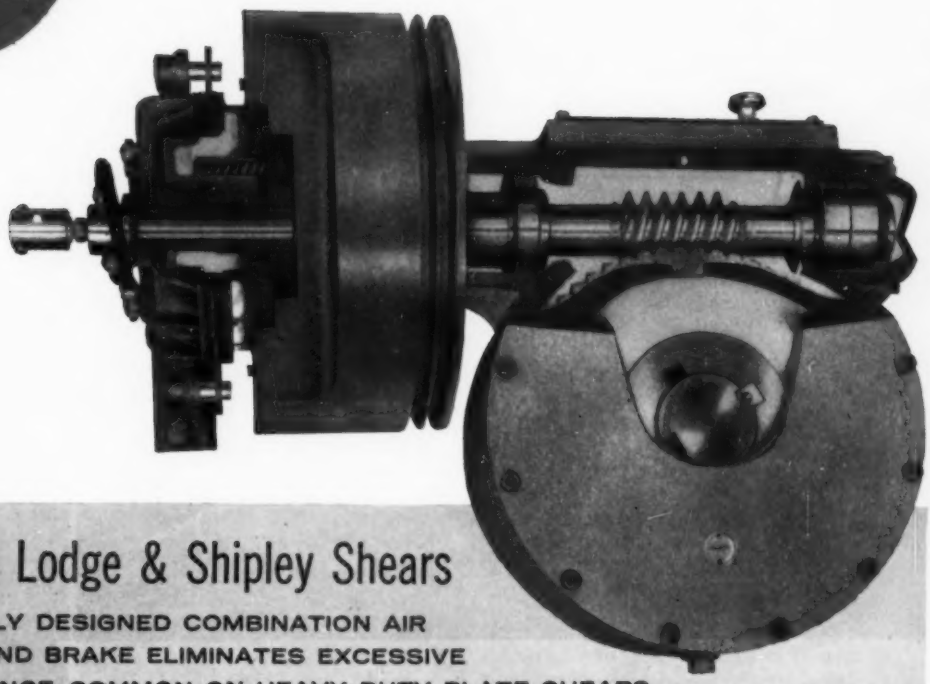
X-264-1R

THE UNITED STATES GRAPHITE COMPANY

DIVISION OF THE WICKES CORPORATION, SAGINAW 23, MICHIGAN

GRAPHITAR® CARBON-GRAPHITE • GRAMIX® POWDER METALLURGY • MEXICAN® GRAPHITE PRODUCTS • USG® BRUSHES

EXTRAS on the machine . . . not on the invoice!



Only on Lodge & Shipley Shears

...SPECIALLY DESIGNED COMBINATION AIR CLUTCH AND BRAKE ELIMINATES EXCESSIVE MAINTENANCE COMMON ON HEAVY DUTY PLATE SHEARS

The "standard extras" you find on Lodge & Shipley Shears, although not reflected in the price, are important in time-saving, effortless operation, accuracy and low-cost service.

THE COMBINATION AIR CLUTCH AND BRAKE, for example . . . its single unit design positively eliminates overlap between clutch and brake. Disc-type construction is self-adjusting for fast, smooth starting and safe, positive stopping. The clutch provides automatic overload safety; the brake applies automatically in the event of electrical or air supply failure.

NO OTHER SHEAR, EVEN AT EXTRA COST, can offer the exclusive combination of features found, for instance, on the ½" Lodge & Shipley Shear:

- 2-stage Hydraulic Holddown System
- Remote-operating Foot Control • Ball Transfer Table
- Motorized Front-Operated Back Gauge
- One-piece Shaft with Integral Eccentrics
- Blade Clearance Indicators • Air Counterbalances
- Air-cushioned Back Gauge • Blade Changing Jigs
- Fast, One-man Upper Blade Adjustment
- Independent Holddown Fingers • Quad-life Worm Gear

Capacities to ½" x 12'

Find out how much more you get . . . **WITHOUT EXTRA COST** . . . on a Lodge & Shipley Shear. For details, see Sweet's Machine Tool File or request Bulletin No. PS-15 from: **The Lodge & Shipley Co., 3056 Colerain Ave., Cincinnati 25, Ohio.**

Lodge & Shipley Your LODGE-ical Choice!

NOW YOU CAN GRIND AND FINISH

NEW BAYFLEX DOUBLE-DUTY

Illustrations above show Bayflex Double-Duty in action, held at correct angle for weld bead grinding (top) and for finishing (bottom)

CIRCLE 230 READER SERVICE CARD

WITHOUT CHANGING WHEELS!

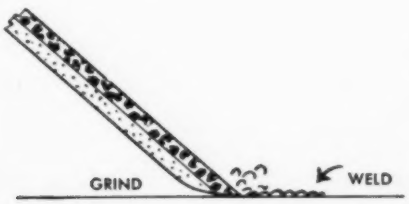
There are two important angles to consider before you buy new weld-grinding or finishing wheels. Bay State's new Bayflex Double-Duty raised hub disc-wheel has them *both!*

The "DD's" unique, two-layer construction gives you two grinding angles: One is 30° - 45° which gives you fast stock removal for grinding weld beads . . . and the other is 10° - 20° which gives you a finish without gouging, a finish so smooth it's just short of a polished surface.

The upper layer for weld grinding comes in a single, standard specification. The lower finishing or blending layer comes in your choice of five different grits (24, 36, 54, 80 and 120) for every type of finishing job from heavy steels through light stainless sheets to aluminum and copper.

Your Bay State representative is ready now to demonstrate the Bayflex Double-Duty in your plant under normal working conditions. Get in touch with him and see what he can do to cut costs and speed up your weld grinding. You'll find he's more than a good salesman . . . because he's an experienced abrasive specialist, too. *Better grinding at lower cost . . . that is his business.*

IS 2 WHEELS IN 1



Upper layer removes stock rapidly when disc is held at 30° - 45° angle.

Lower layer smooths and blends surface when held at 10° - 20° angle.

BAY STATE ABRASIVES

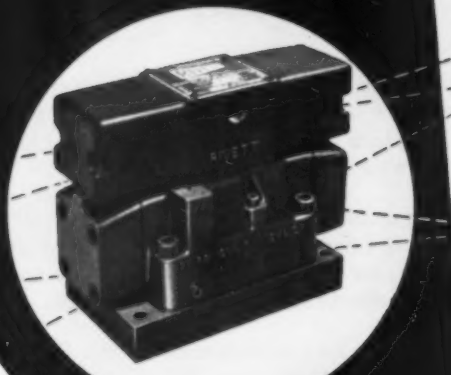
BAY STATE WHEELS of PROGRESS

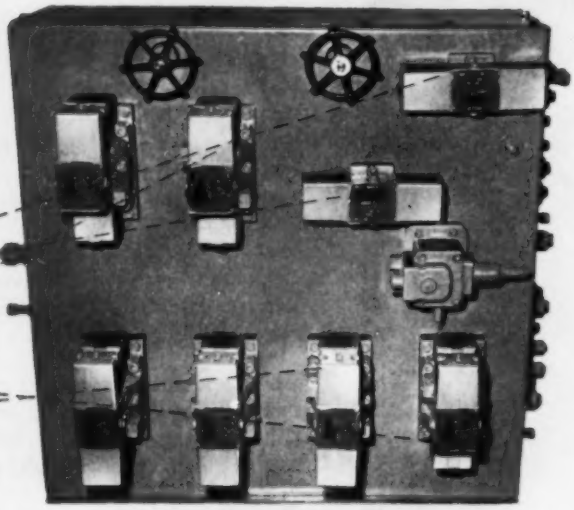
Bay State Abrasive Products Co., Westboro, Mass.
In Canada: Bay State Abrasive Products Co., (Canada) Ltd., Brantford, Ontario.
Branch Offices: Bristol, Conn., Chicago, Cleveland, Detroit, Pittsburgh, Los Angeles.
Distributors: All principal cities

CIRCLE 231 READER SERVICE CARD

13 cylinder circuit controlled automatically

with Rivett Panel Valves





Integrated control panel with Rivett single and double solenoid pilot-operated valves; and double solenoid pilot valves.

These features offer better automatic control

1. 3000 P.S.I. conservatively rated.
2. Meet all J.I.C. Standards.
3. Greater flow capacity (¾" rated at 28 G.P.M. at 15 ft. per sec.)
4. 7 spool designs. All interchangeable in same body.
5. Dust-sealed. Moisture-resistant cover.
6. Shock-resistant spool
7. Shock-mounted, continuous duty solenoids.

Intricate circuit of new plastic injection molding machine contains 2 injection cylinders, an ejector cylinder, gate cylinder, metering cylinder, 2 die cylinders, 2 post cylinders, 2 plate cylinders and 2 shot cylinders—hydraulically controlled by 7 Rivett Panel Mounted Solenoid Operated Valves.

The Michigan manufacturer of this unit selected Rivett Valves for their: 1—greater flow capacity; 2—low pressure drop; 3—compactness; 4—shock resistance and 5—reduced maintenance.

Increasing numbers are finding Rivett 6600 Series Valves the most practical for control of automatic operations. Working with Rivett engineers and sales representatives, these users are able to improve a machine's design, operation, life, and above all to lower its cost!

RIVETT LATHE & GRINDER, INC.
Dept. AM-6, Brighton 35, Boston, Massachusetts

Get Data-filled Valve Catalog. Shows flow for all piston designs; working drawings; specifications. Write for free copy today!

The Better You Know Hydraulics, The Better You Like

Representatives In All Principal Cities

RIVETT furnishes a complete power package

AIR AND HYDRAULIC — VALVES, CYLINDERS, POWER UNITS

Member National Fluid Power Association

"Been workin' her hard for 14 years ...she's as fast and accurate as the day she arrived"

NIAGARA SHEARS

Precision made Niagara Shears are built to cut with micrometer accuracy . . . *and to keep cutting that way.*

Thousands are in use, but comments are nearly identical. Makes no difference how hard they're worked. Three shifts a day, month after month, year after year . . . a Niagara Shear *continues* to be accurate.

"Don't have to change knife clearance"

No adjustments needed for cutting different thicknesses of stock . . . even at the same time . . . with consistently accurate, burr-free results. *And much longer knife life!* The secret is in the rigidity of Niagara's exclusive box section design. "Upped production 25%," says one user, "because we have fewer adjustments to make."

"Costs less to operate"

There's less to do, less to learn and less to go wrong. Never even have to worry about damaging the machine by forgetting to change the knife clearance. Once set, Niagara Shears need no further adjustment. "Been using Niagara's for 10 years . . . never had downtime for repairs or maintenance," says another user. Even after long, hard use when it becomes necessary to turn the blades or change knives, it's a very easy matter. Nothing like Niagara Shears for simplicity.

FACT BOOK FOR YOU

Bulletin 69 is filled with customer reports on Niagara Shear performance. You'll value it. Write today.

NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y. *District Offices and Distributors in Principal Cities*

CIRCLE 233 READER SRVICE CARD

Bertsch & Co. finds solution to lubrication problem–

RYKON

Centralized lube system pumps grease through 80 ft. lines in cold temperature; no clogging

Problem: Bertsch & Company, Cambridge City, Indiana, makes pinch rolls and other metal bending equipment. Some Bertsch pinch rolls bend plates 4¼ inches thick by 16 feet wide for use in atomic submarines. Bearings on this big Bertsch machine share a bending pressure of 4.2 million pounds. A centralized lubrication system used on one pinch roll model had to pump grease 80 feet. Greases tried could not be pumped this distance without clogging lines. Since machines are shipped all over the world and are often in operation in cold climates, Bertsch had additional problems. The grease had to be

Sons of founder. Harry E. and Robert O. Bertsch talk with Standard Oil lubrication specialist Donald M. Simmons. Don is well qualified to work with customers on difficult lubrication problems. He has the training and experience for it. Don graduated from Purdue. He has 7 years service with Standard, has completed the Standard Oil Sales Engineering School.

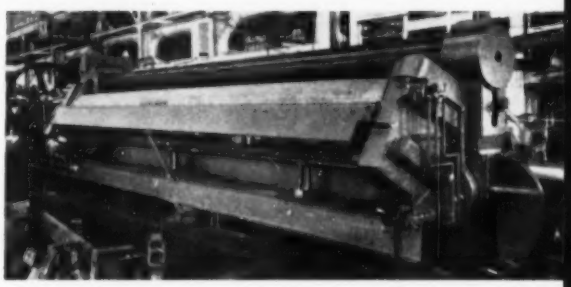
with Standard Oil's

Grease R

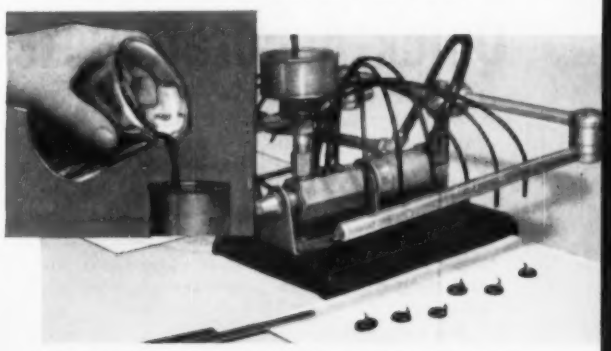
pumpable in cold temperatures. It had to be foolproof so that customers beyond the reach of service calls would experience no problems. Equipment had to uphold Bertsch's eighty year reputation.

What was done: Bertsch turned to Standard Oil for help. They have been customers of Standard's for 69 years, so the move was logical. And Standard Oil man, D. M. Simmons had the answer. RYKON Grease R. This is a rheopectic grease, one that flows like an oil. Its rheopectic properties cause it, under slight shearing stresses, to turn to a thick, durable grease. RYKON Grease R flows as a fluid to the pump through the equipment's central lubrication system. There it lubricates the bearings as a grease.

What you can do: Maybe you manufacture equipment that needs a centralized lubrication system and you have been looking for a grease like RYKON R. Maybe you operate equipment with centralized lubrication systems. Then you need to know about RYKON Grease R. Get the facts from your nearby Standard Oil lubrication specialist anywhere in the 15 Midwest and Rocky Mountain states. Or write **Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.**



A Bertsch 80 ft. pinch roll, largest on record. RYKON Grease R is used in the central lubrication system of this giant unit.



Lab demonstration shows how RYKON Grease R works. Grease is poured into reservoir as a fluid. The shearing action exerted by pump and outlets irreversably converts fluid to a grease. Grease is ejected from outlet lines as in lubrication system.

STANDARD

You expect more from Standard and you get it!

How Allison Wheels help you get

Quick, Accurate Cuts on Any Material, Any Shape

• Abrasive cutting can give you *cleaner* cuts, *faster*—on almost any material from titanium to fire brick. But only when you use the proper cut-off wheel can you get the best results. That's where your ALLISON-CAMPBELL Field Engineer can help. Show him your cut-off problem, and he can select the ALLISON wheel that will cut your metals and other hard materials at speeds of just a few seconds per square inch—fine finish, without burn and with little or no burr—accuracy within close tolerances.

No matter what cut-off problem you have, chances are the right ALLISON wheel will do the job more quickly, less expensively, and more accurately than any other cut-off method. There's a complete selection of ALLISON wheels for every abrasive cutting application.

• • •

Resinoid bonded wheels are designed specifically for dry abrasive cutting machines. They cut at rates of 3 to 5 seconds per square inch, will cut 2" x 2" hardened steel on a standard chop stroke machine in 16 seconds.

Rubber bonded wheels are used primarily for wet cutting operations to obtain the finest quality cuts on all types of steel, alloys, titanium, glass, and plastics. Rubber bonded wheels are sometimes used for cutting tubing dry with minimum burr.

Masonry cutting blades, including reinforced types, are available for both wet and dry cutting of such materials as fire brick, concrete block, glazed tile, and transite. Use of the proper ALLISON wheel can reduce down-time for furnace repairs by speeding the installation of refractory brick.

Fiberglass reinforced wheels provide high cutting speeds while giving extra strength for many foundry cutting jobs. They're available in both resinoid and rubber bonded types, help prevent accidents and costly breakage.

GET THE COMPLETE STORY! Write for **Bulletin DH-214** for detailed information on abrasive cutting techniques, and the wide selection of ALLISON wheel specifications. ALLISON wheels are available 3" to 34" diameter, .006" to 3/16" thick. And remember—your ALLISON-CAMPBELL Field Engineer can give you specialized help. His know-how is your assurance of the efficient, accurate, and economical cutting you can expect from modern abrasive cutting techniques.

ACCO **ALLISON** ABRASIVE CUTTING **WHEELS**

Allison-Campbell Division • American Chain & Cable Company, Inc.

923 Connecticut Avenue, Bridgeport 2, Conn.

Carlton

specialists in radial drills

OA

9" column 3'-4' arms

1A

9"-11" column 3'-4'-5' arms

3A

13"-15"-17" column 4'-5'-6'-7' arms

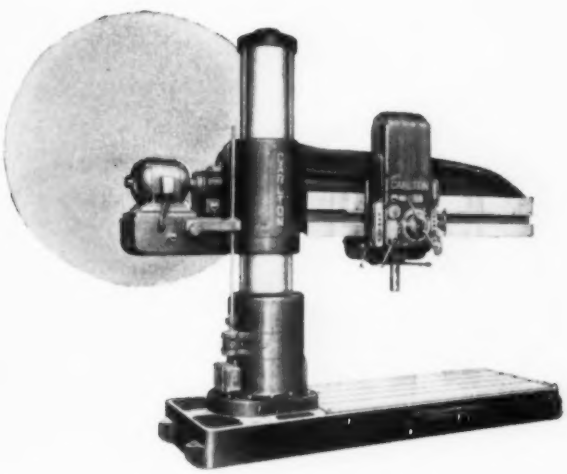
4A

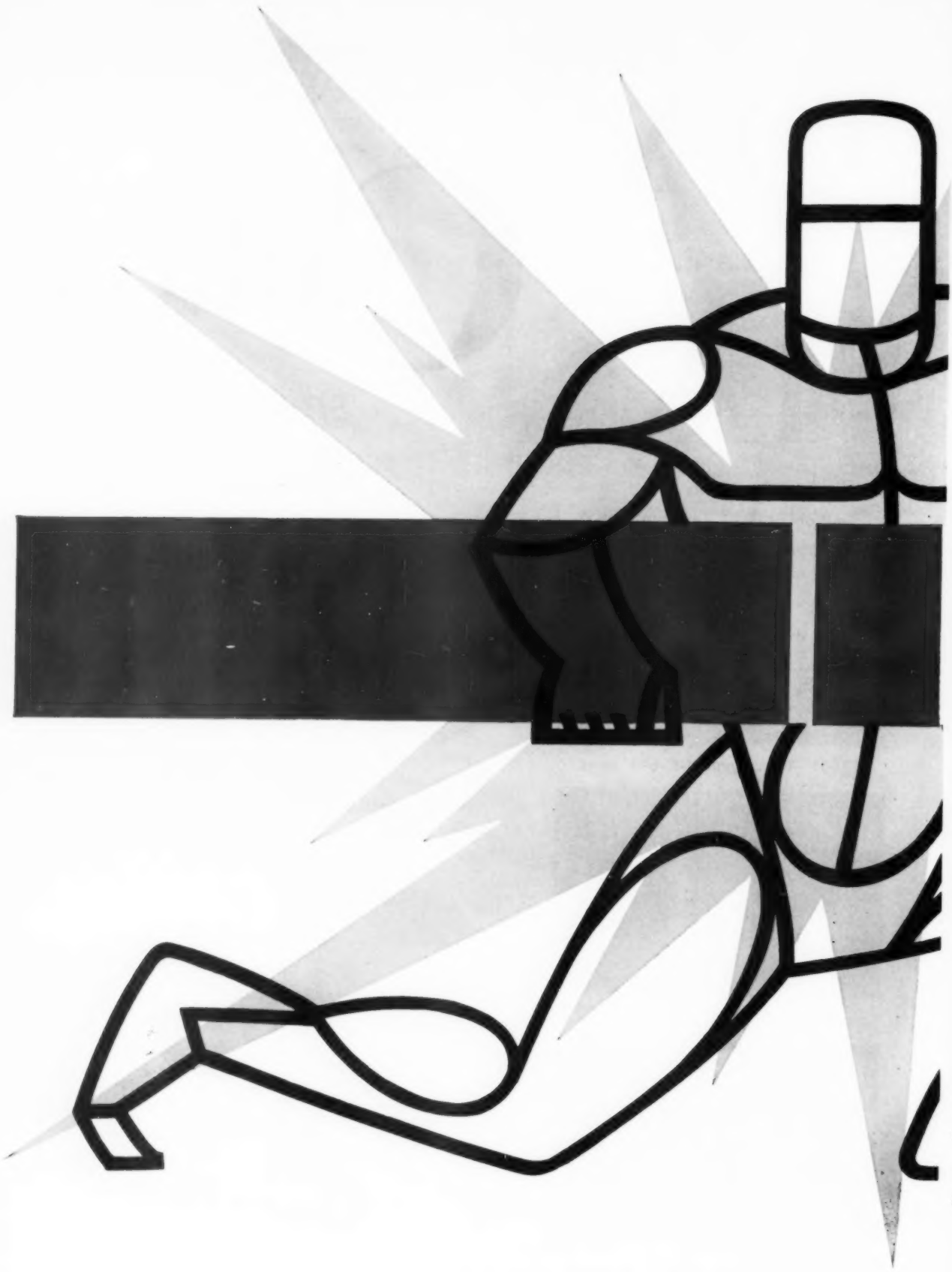
19" column 6'-7'-8' arms

5A

22"-26" column 7' to 12' arms

Carlton has specialized in radial drill research, engineering and manufacturing since 1916. Our close contact with—and intimate knowledge of industry's drilling requirements—have produced a wide line of the most modern and up to date radial drills. Made in arm lengths from 3-ft. to 12-ft., column diameters from 9" to 26". Programming, pre-select and manual speed-feed controls, plus special bases, tables, and jigs available for additional productivity. For further information, send today for free descriptive bulletins.
The Carlton Machine Tool Co., Cincinnati 25, Ohio.





COMBINES SUPERB WELDABILITY WITH EXTRA STRENGTH

N-A-XTRA

BEST LOW-ALLOY EXTRA-STRENGTH STEEL YOU CAN BUY

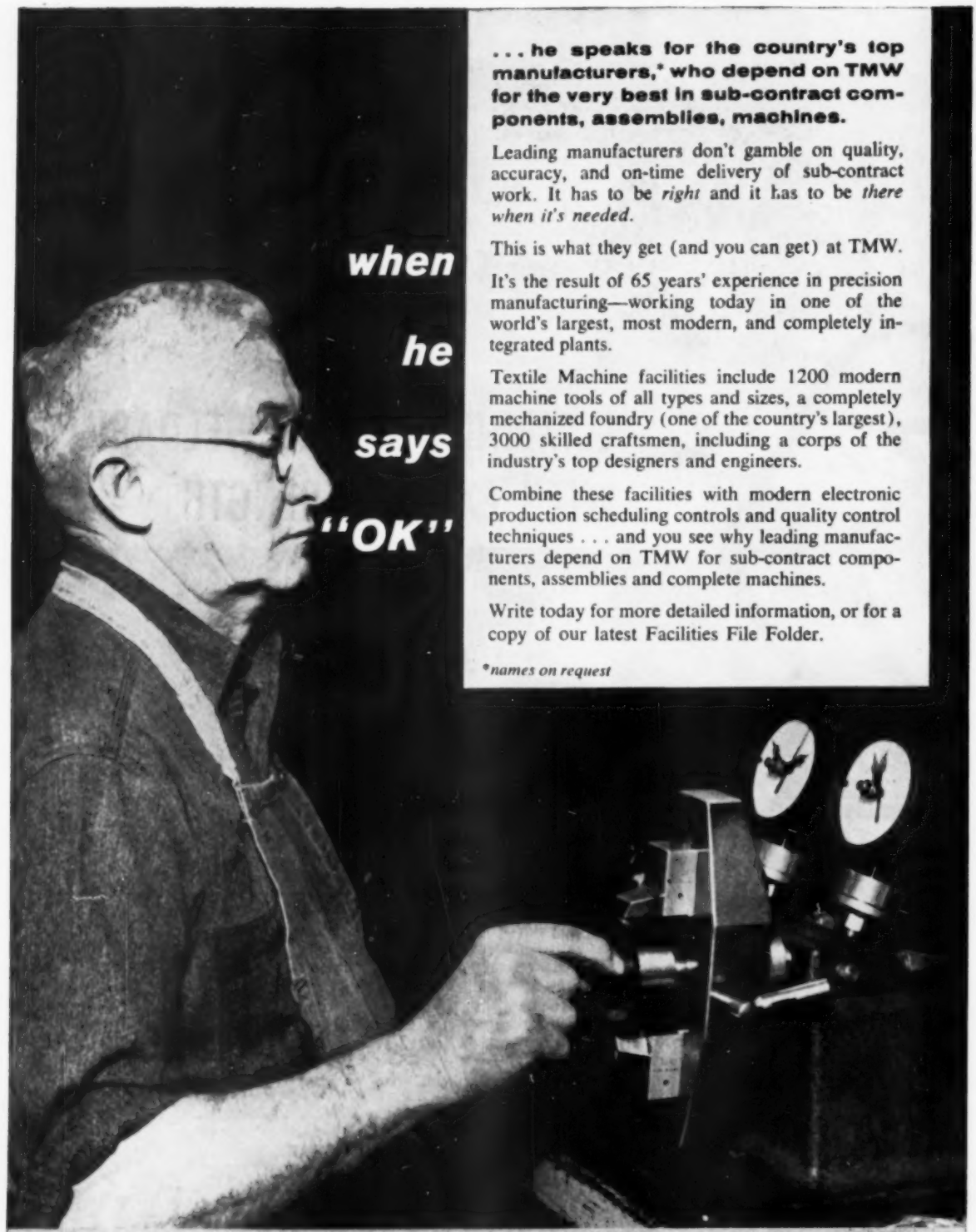
When only the strongest steels will do, specify N-A-XTRA HIGH-STRENGTH. This low-alloy heat-treated steel is now available in minimum yield strengths ranging from 80,000-110,000 psi.

Along with this great strength, N-A-XTRA is readily formed and fabricated. It can be welded by any process. The most drastic welding tests on N-A-XTRA have shown no underbead cracking, even when plate temperatures are as low as —60°F.

Because N-A-XTRA is nearly three times stronger than mild carbon steels, it gives designers an opportunity to eliminate useless dead weight from finished products and realize substantial savings. Let us show you how N-A-XTRA HIGH-STRENGTH steel can do a job for you. Write Great Lakes Steel Corporation, Detroit 29, Michigan, Dept. X-7.

GREAT LAKES STEEL

A DIVISION OF NATIONAL STEEL CORPORATION



. . . he speaks for the country's top manufacturers,* who depend on TMW for the very best in sub-contract components, assemblies, machines.

Leading manufacturers don't gamble on quality, accuracy, and on-time delivery of sub-contract work. It has to be *right* and it has to be *there when it's needed.*

This is what they get (and you can get) at TMW.

It's the result of 65 years' experience in precision manufacturing—working today in one of the world's largest, most modern, and completely integrated plants.

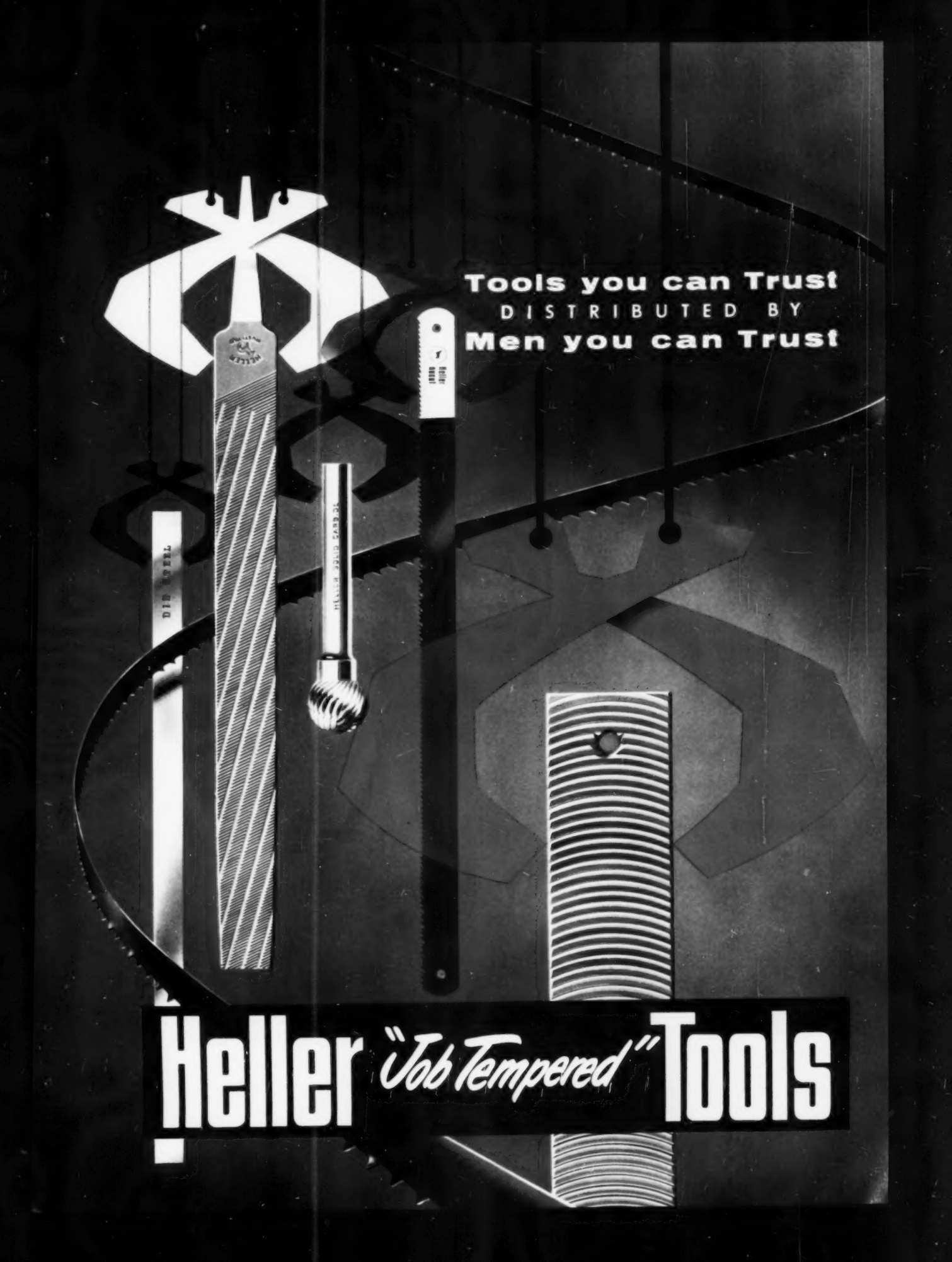
Textile Machine facilities include 1200 modern machine tools of all types and sizes, a completely mechanized foundry (one of the country's largest), 3000 skilled craftsmen, including a corps of the industry's top designers and engineers.

Combine these facilities with modern electronic production scheduling controls and quality control techniques . . . and you see why leading manufacturers depend on TMW for sub-contract components, assemblies and complete machines.

Write today for more detailed information, or for a copy of our latest Facilities File Folder.

**names on request*

TEXTILE MACHINE WORKS
Contract Division • Reading, Pennsylvania


Tools you can Trust
DISTRIBUTED BY
Men you can Trust
Heller "Job Tempered" Tools

TRUSTED WHEN UNIFORMITY COUNTS

Heller

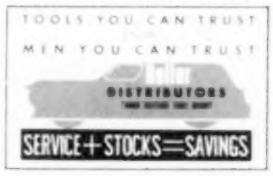
"Job Tempered"

METAL CUTTING Band Saws

CONSISTENTLY DEPENDABLE PERFORMANCE is assured by the *uniform teeth, uniform set* and *uniform temper* of every Heller Band Saw . . . as certified by American Standards Testing Bureau. This three-point uniformity stems from the unique combination of precision manufacture and "Job Tempering" that distinguishes the Heller brand from all others.

EXTRA VALUE is built into every Heller Band Saw by "Job Tempering" . . . a technique based on Heller's long experience in matching steel specifications and unusual heat-treating methods to metal-cutting demands. Special machining methods and precision tooth setting result in superior performance and longer life.

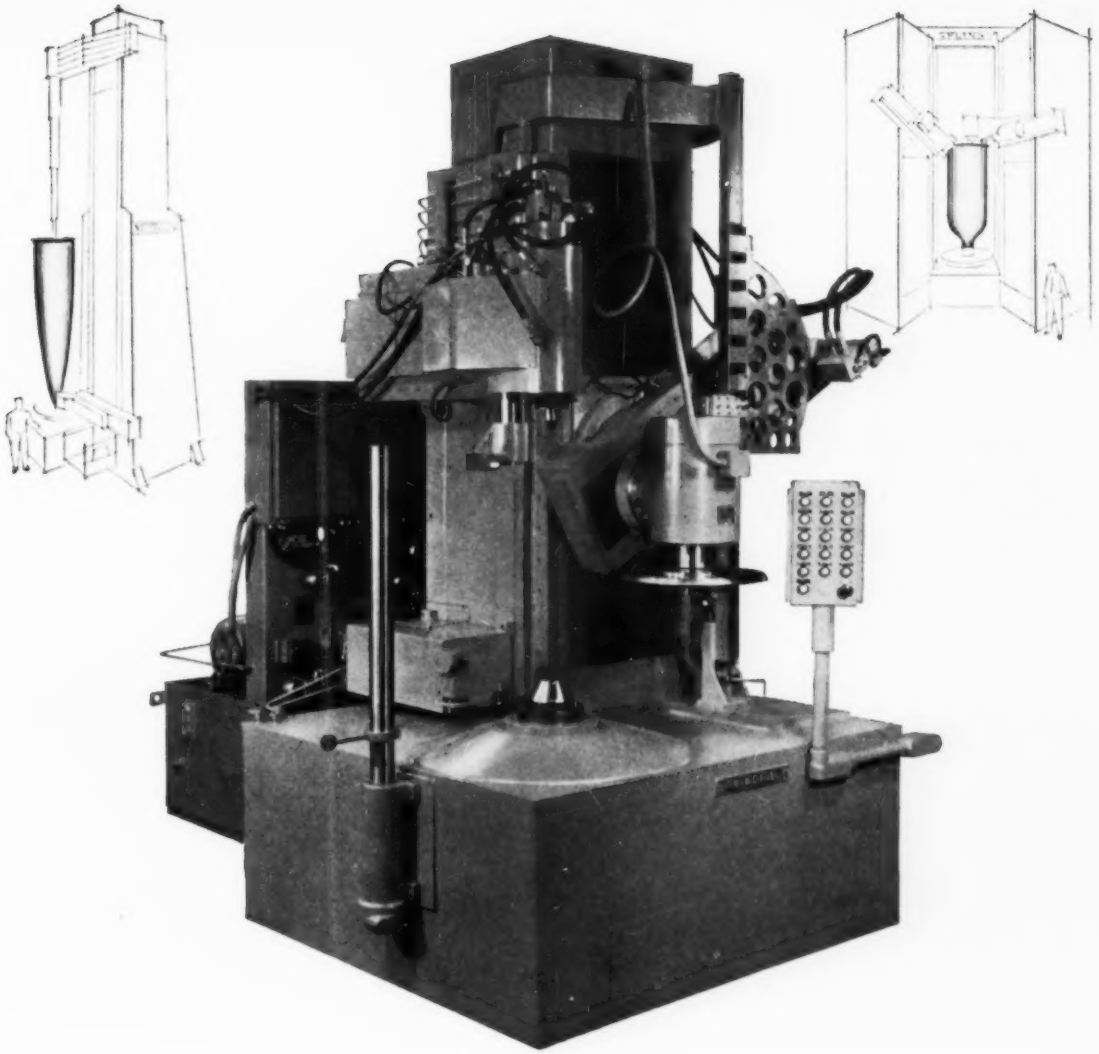
YOUR TRUSTWORTHY HELLER DISTRIBUTOR is fully stocked with Heller "Job Tempered" Band Saws that fit your needs . . . in regular and wavy set . . . in standard, skip and hook tooth shapes . . . in lengths and widths for all machines and all contours. Call on this dependable source of cost-cutting tools for the prompt deliveries that prevent costly down time.



HELLER TOOL CO.

America's Oldest File Manufacturer
NEWCOMERSTOWN, OHIO
Subsidiary of Simonds Saw and Steel Co.

Branches and Warehouses Newark • Detroit • Chicago • Shreveport • Los Angeles • Portland, Ore



Vertical Grinding missile shapes

If you have anything to do with contoured missile shapes you should find out about this brand new breed of machine —the vertical contour grinder. The machine shown above turns and grinds a laminated missile nose whose surface must be smooth and accurate. The point is, this machine was designed for specific missile requirements, and yours may be similar. In vertical grinding the force of gravity works to help achieve concentricity, uniform wall thickness, accurate interior and exterior contours and extreme micro-inch finish. These grinders are designed especially for ceramic, metal, plastic and combinations of materials. Size and weight of workpiece is not limited.

The Springfield Machine Tool Company pioneered the principle of vertical grinding and was one of the first builders to incorporate the principle of hydraulic contouring in a machine tool. These ideas are found in hundreds of machines bearing the Springfield nameplate, and are your best assurance that we can bring to your problem both experience and imagination. Telephone, telegraph or write for informative literature.

THE SPRINGFIELD MACHINE TOOL CO., SPRINGFIELD, OHIO

SPRINGFIELD

C. T. WEITZEL, President, Mechanical Specialties Co.
5700 West 96th Street, Los Angeles, California

a man who came to Fair Street

"We were skeptical of the claims for the JIGMIL Technique until we came to Fair Street. There we found the machine that met our need for accuracy and versatility with features to spare.

"As a contract manufacturer of tools, dies and precision components, we long felt the need for something new in the way of a precision boring and milling machine. Among other things, we wanted a machine having a configuration which would permit easy set-ups of a wide range of awkward and bulky work pieces. In 1946, we heard about the JIGMIL and the JIGMIL Technique of jigless boring. The claims for this machine were so unusual that we discounted much of what we heard, but decided that we should at least look into it. At Fair Street, we found the machine that met all our requirements with features to spare. Our first JIGMIL put us in a position to handle an entirely different class of work and without doubt, aided materially in our subsequent growth and development. Today we have four JIGMILS which are consistently busy and consider them ideal job shop machines."

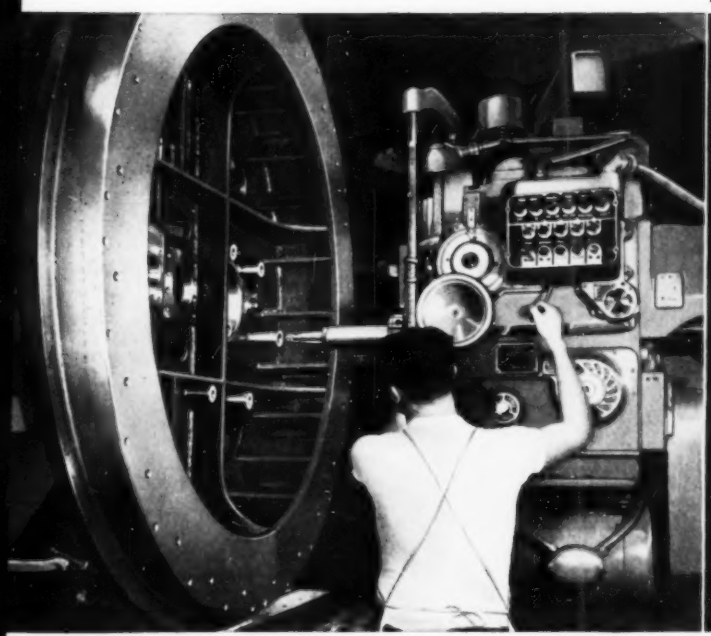
C. T. WEITZEL

DE VLIEG MACHINE COMPANY, 450 FAIR STREET

CIRCLE 244 READER SERVICE CARD

SOME OF OUR JIGMIL USERS

Aireserch Mfg. Co., Div. The Garrett Corp.
Bell & Gossett Co.
The Brush Beryllium Co.
H. W. Butterworth & Sons Co.
Byron Jackson Pumps, Inc., a Subsidiary of Borg-Warner Corp.
Cameron Iron Works, Inc.
The Cleveland Pneumatic Tool Co.
Delco-Remy Div. General Motors Corp.
Eastern Air Lines, Inc.
Euclid Div. GMC
Fairchild Camera and Instrument Corporation
General Atomic Div. General Dynamics Corp.
Goodyear Aircraft Corp.
C. L. Gougler Machine Co.
Greenlee Bros. Co.
Hoover Tool & Die Co.
Hughes Aircraft Co.
The Hydraulic Press Mfg. Co.
I-T-E Circuit Breaker Co.
Kaiser Industries Corp.
Koppers Co., Inc.
Kurt Mfg. Co.
Librascope Incorporated
Lycoming—Div. of Avco Manufacturing Corporation
Manning, Maxwell & Moore, Inc.
Massachusetts Institute of Technology
Maytag Co.
Menasco Mfg. Co.
McKiernan-Terry Corporation
National Cash Register Co.
Norden-Ketay Corp.
Robbins & Meyers, Inc.
Rocketdyne Div., North American Aviation, Inc.
Rohr Aircraft Corp.
AC Spark Plug Division, General Motors Corp.
Sperry Farragut Co., Division of Sperry Rand Corp.
Stratos Div. Fairchild Engine & Airplane Corp.
Sundstrand Machine Tool Co. (Aviation Div.)
Sylvania Electric Products, Inc.
Utica-Bend Corp., a Subsidiary of Curtiss-Wright Corporation



A FEW PROVEN ADVANTAGES OF THE JIGMIL TECHNIQUE

- Eliminates cost of expensive jigs and production delays resulting from their manufacture.
- Simplifies tooling.
- Employs automatic functions to reduce factors of human error even in close tolerance work.
- Makes possible greater flexibility of product design.
- Improves end product by permitting interchangeable assembly of parts without hand fitting.
- Increases production and product accuracy.

ACCURACY IS AN ECONOMY!

A TYPICAL EXAMPLE OF JIGMIL PRECISION
applied to the guided missile program

Mechanical Specialties Co. uses the JIGMIL Technique for machining pieces such as this 3500 lb. traversing-launching ring for guided missiles. Part is set-up on a Model 3B-96 JIGMIL. Critical machining involves boring 24 indexing holes on a 60" dia. with hole spacing of ± .0005; an interior hole pattern of 5 holes coordinated to a master within ± .00025; 30 additional holes in a 30" x 36" rectangular pattern to ± .001; accurate milling of locating pads and boring of 3 large critical bores to ± .001.

Our newest catalog will help you decide. May we send it?

WILL YOU BE THE NEXT TO VISIT FAIR STREET

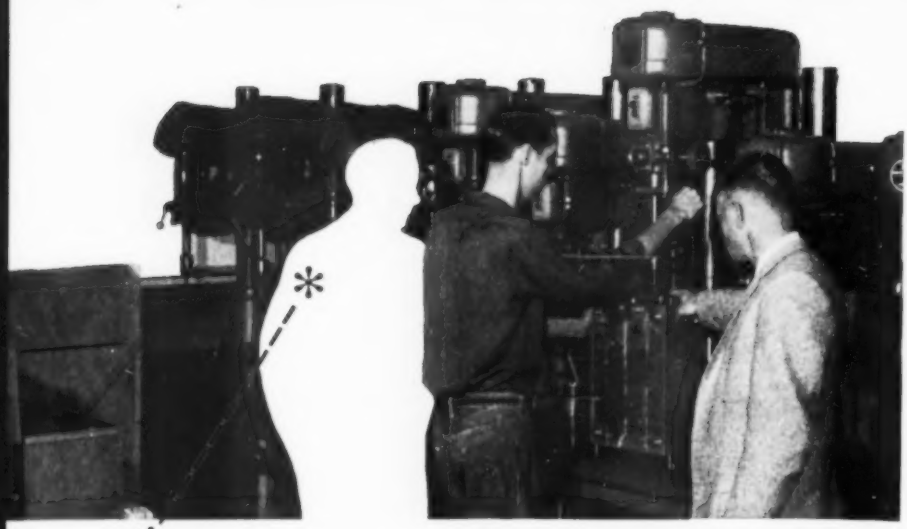
DeVlieg

SPIRAMATIC JIGMILS®

ACCURATE HOLES AND FLAT SURFACES IN PRECISE LOCATIONS

FERNDALE • DETROIT 20

CIRCLE 245 READER SERVICE CARD



YOUR W-T DEALER—

the plus value you get with...

Your Walker-Turner dealer is a good man to know better. On his staff are specially-trained men who know metalworking from "A" to "Z"—men who have the experience and ability to assist you with any tooling problem you might have. And these metalworking experts are ready, willing and able to provide complete, engineered set-ups to best meet your specific needs.

There are other reasons to call on your Walker-Turner dealer when you're in the market for metalworking tools. He offers a full line of rugged, versatile, low-cost W-T "Light-Heavyweights" that have proved their superiority in plants all over the country—he maintains a large inventory of new machines and spare parts—and his entire organization is built to give fast, personalized service (otherwise he wouldn't be a W-T dealer).

If you haven't as yet experienced the benefits of doing business with your Walker-Turner dealer, why not give him a call soon. He's listed under "Tools" in your classified telephone book.

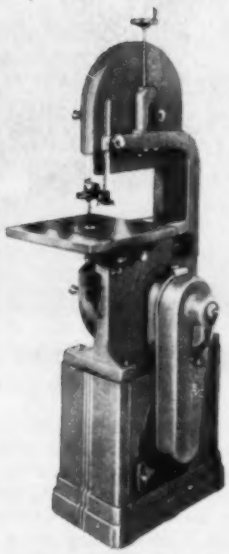
FREE CATALOG

Write to Walker-Turner Division, Rockwell Manufacturing Company, Dept. WF-21, 400 N. Lexington Ave., Pittsburgh 8, Pa.

WALKER-TURNER
"LIGHT-HEAVYWEIGHT" MACHINE TOOLS
another fine product by
ROCKWELL

15" Drill Press

WALKER-



14" 8-Speed Band Saw

6" Bench Grinder

CIRCLE 246 READER SERVICE CARD

CIRCLE 247 READER SERVICE CARD ►

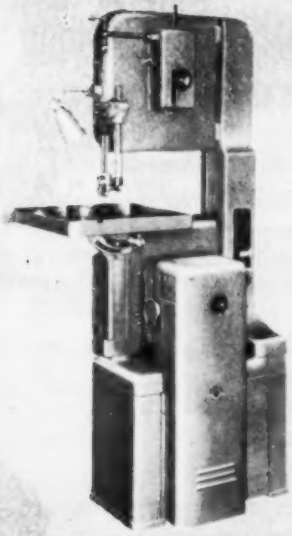
17" Drill Press

20" Drill Press

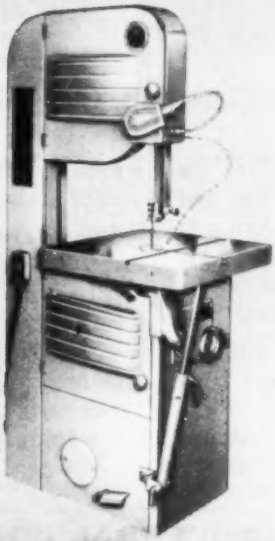
Radial Drill

Cut-off Machines

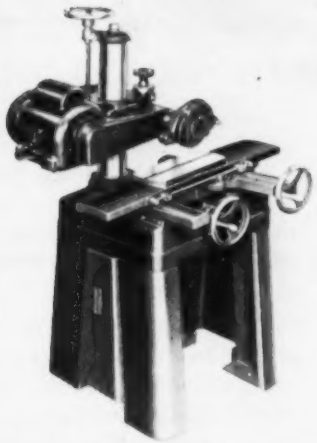
TURNER "LIGHT-HEAVYWEIGHT" MACHINE TOOLS



16" Variable Speed Band Saw



20" Variable Speed Band Saw

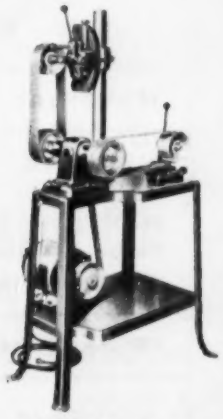


Surface Grinder

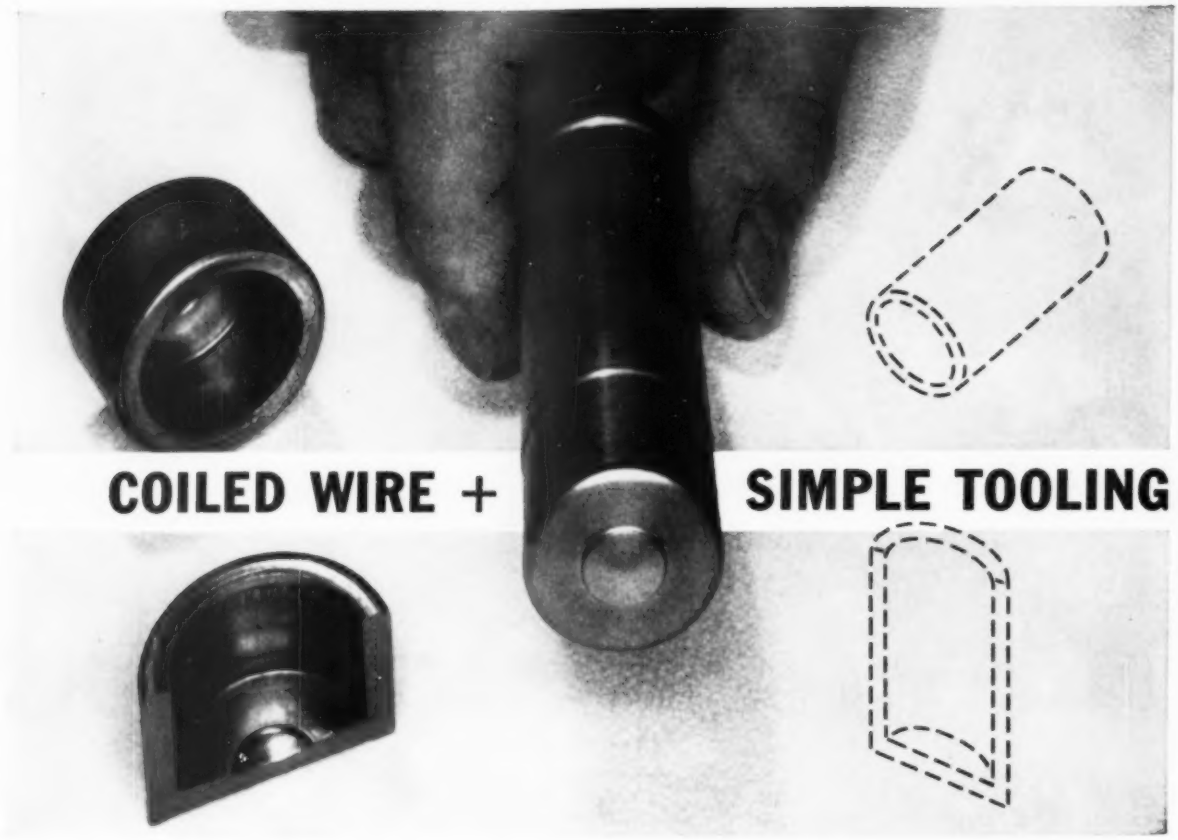
6" Tool Grinder

7" Standard Grinder

Belt and Disc Surfacer



2½" Belt Grinder

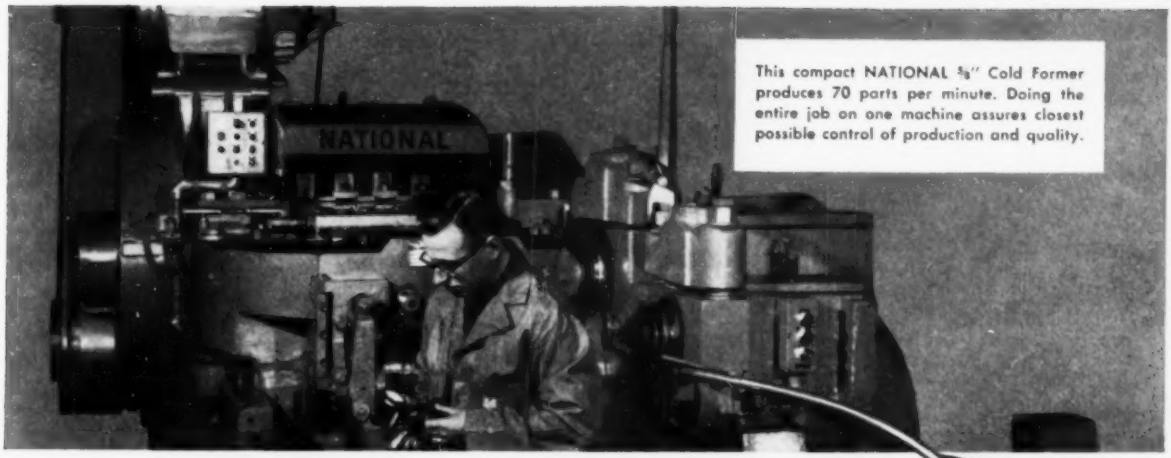


In cold-forming hollow parts from wire, the extrusion punch is the most critical and perishable element of the tooling. And yet, the typical steel punch shown above costs only a few dollars. Punch life for the universal joint bearing cup part is excellent.

Part "X" (name and illustration withheld at customer's request) is a deeper extrusion of higher-carbon material. Punch life for this practically-finished part is also remarkable even though the blanks – cut off from wire right in the Former – *are not end-coated!*

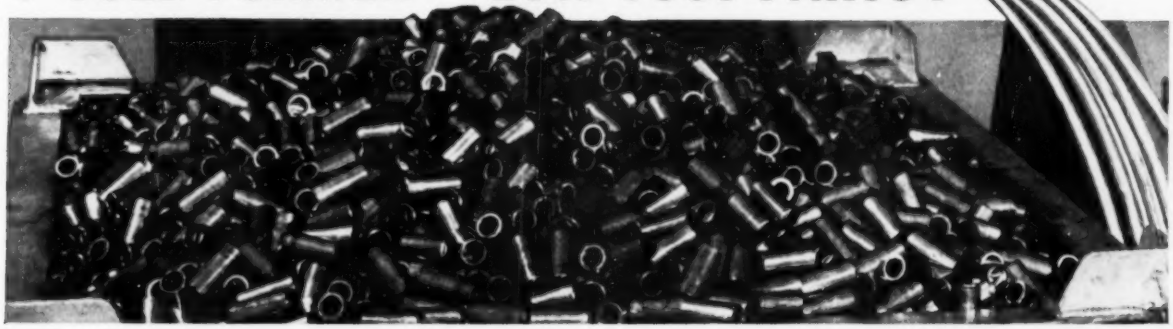
These are two more important cold-extruded jobs which forward-looking U. S. parts makers are now producing – automatically and successfully from coiled wire – on NATIONAL Cold Formers. No slugs to prepare, no in-between heat-treating or annealing, less handling, and many fewer operations.

PART	UNIVERSAL JOINT BEARING CUP	PART "X"
MATERIAL	C-1008 Drawn Coiled Wire	C-1016 Drawn Coiled Wire
MACHINE	3/4" NATIONAL Cold Former	1/2" NATIONAL Cold Former
PARTS PER MINUTE	60	80
EXTRUSION DIE LIFE	Practically Unlimited	Practically Unlimited
IS PART IN PRODUCTION?	Yes, at Pottstown Div. Dana Corp., Pottstown, Pa.	Yes, plant name and location withheld by request



This compact NATIONAL ⅝" Cold Former produces 70 parts per minute. Doing the entire job on one machine assures closest possible control of production and quality.

+ COLD FORMER = LOW COST PARTS!



WHAT IS THE BEST WAY TO DO AUTOMATIC COLD FORMING?

ANSWER: Produce from wire! Cold Formers and Progressive Headers are built upon our conventional Cold Nut Former and Boltmaker designs.

Is Material Expensive?

No. Coiled wire is low-cost material. (Of course, none is wasted by *forming*).

How Long Do Other Tooling Items Last?

Using bearing cup job as an example: Cutter and quill, hundreds of thousands of parts each; carbide die life is measured "by the millions."

What Preparation Does Coiled Wire Need?

None. You buy inexpensive drawn wire, ready to start into the Former.

How Do You Get the Initial Blank?

The Former cuts off accurately, and automatically transfers the blank from station to station until finished.

Do Physical Properties Measure Up?

They are excellent. Cold Forming actually improves them.

What About Labor and Floor Space?

Materially reduced. Verify by comparing Cold Forming with your present methods.

What Are the Biggest Advantages?

With the NATIONAL Cold Former you produce parts complete from coiled wire. You eliminate many operations and related handling problems. Result? More quality parts at lower production cost!

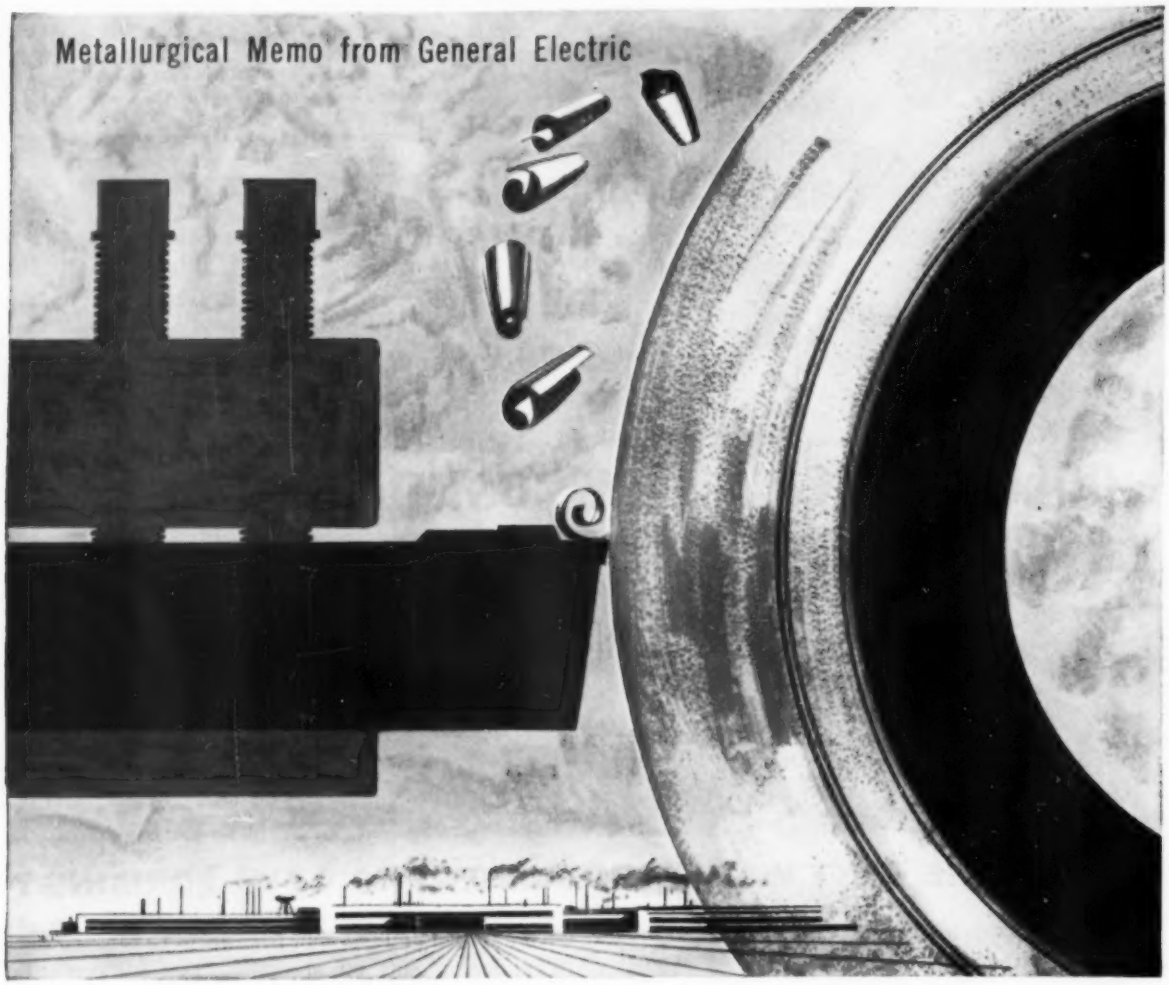
Can Your Jobs Be Made More Profitably by Automatic Cold Forming?
We Welcome You to Tiffin for a Discussion of Your Work

Founded 1874—DESIGNERS and BUILDERS of MODERN FORGING MACHINES • MAXIPRESSES • REDUCEROLLS • COLD HEADERS BOLTMAKERS • NUT FORMERS • TAPPERS • NAILMAKERS CO-PIONEERS WITH INDUSTRY OF ADVANCED METALWORKING PRODUCTION METHODS

NATIONAL MACHINERY CO.

TIFFIN, OHIO, U. S. A.

HARTFORD DETROIT CHICAGO



Why 242 different toolholders?

Metallurgical Products Department reports on an expanded new line of Lift-O-Matic toolholders . . . 242 sizes to speed changeovers on every job

Nobody needs to tell you what carbides have done for metalcutting . . . or how Carboloy® disposable inserts have led the way. *But making inserts is only half the job;* the other half is to provide you with toolholders that let you get full value from these miracle metals.

Carboloy Lift-O-Matic toolholders do this job. There are now three types—positive rake, negative rake, and tracer. All provide access to the clamp setscrew from either top or bottom—together with a self-raising chip-breaker clamp—for fastest possible indexing. All cut your inventory needs by providing interchangeability of parts. In addition, there is a full line of Carboloy *heavy-duty* toolholders.

This expanded Lift-O-Matic toolholder line is stocked by your *local* Authorized Carboloy Distributor—3 types, 9 styles, 242 sizes—*plus* the widest range of styles, sizes, and grades of *inserts* in the industry. Call him (see the Yellow Pages under "Carbides"); or write: *Metallurgical Products Department of General Electric Company, 11149 E. 8 Mile Ave., Detroit 32, Michigan.*

CARBOLOY®
CEMENTED CARBIDES

METALLURGICAL PRODUCTS DEPARTMENT

GENERAL ELECTRIC

CARBOLOY® CEMENTED CARBIDES • MAN-MADE DIAMONDS • MAGNETIC MATERIALS • THERMISTORS • THYRITE® • VACUUM-MELTED ALLOYS

DELROYD
WORM GEAR SETS

New high efficiency... higher horsepower ratings

JUST OUT

Send for this new Delroyd Worm Gear Sets Catalog #3800. It contains comprehensive information on selection of worm gears, calculation of bearing loads, and other data, much of which has never been published before.

DE LAVAL *Steam Turbine Company*

908 Nottingham Way, Trenton 2, New Jersey

DL-459

WHEN BUYING FOR PRODUCTION—equipment, accessories, materials, supplies—the question often arises: "Who makes it? Where can we get it?"

Reach for the American Machinist Buyers' Guide Issue and you have the answers in an easy-to-use, complete and efficient package.

Bigger... and most complete The newest edition of the Buyers' Guide—your most effective, efficient buying tool—is now in preparation. To be issued in September, 1959, the Buyers' Guide Issue will put at your fingertips the...

Buyers' Guide Section...over 27,000 listings...products of 3,400 manufacturers shown under 1,800 separate product headings;

Metals Supply Section...city-by-city listings of steel warehouses (with types available) plus warehouse list of non-ferrous metal sources (aluminum, copper, brass);

Machine Tool Distributor Directory...local sources for machine tools in your area...presented both alphabetically and by machine tool builders ...with phone numbers and addresses;

Technical Metalworking Sections ...eight editorial-advertising sections covering principal Metalworking functions (Machining, Tooling, Press-Working, Inspection, Materials, etc.).

Easy to use... for you The American Machinist Buyers' Guide Issue is designed with *your needs in mind*. Sim-

plicity of use by production executives guides its preparation. Thus you get...

integrated information sections... major portions of the issue work together... Buyers' Guide Section leads you to Warehouse and Distributor directories... bold-face listings for advertisers refer you to specific pages where you can obtain complete application/specification data from manufacturers;

different colored paper for major sections...enables you to put your hand on exactly the information desired without time-consuming searching... no complicated code references;

"lie flat" binding...allows you to leave volume open at a specific page for reference without losing your place.

Preferred by production management

Just as regular issues of American Machinist are your best source for information on techniques, processes and "what's new", so the Buyers' Guide has become accepted as Metalworking's #1 buying data source.

In a survey* among American Machinist subscribers, it was found that, next to the Yellow Pages of the phone book, the Buyers' Guide was Metalworking production management's most popular reference for industrial product source data.

If the product is made or bought by Metalworking...look first for the source in the Buyers' Guide Issue (the new edition in your hands September 1959).

*available on request

LOOK FOR THIS SIGN

CAPEWELL

for fast, dependable service on

- hand hack saws
- power hack saws
- band saws
- hole saws
- hammers
- ground flat stock

LOOK FOR THIS SIGN

INDUSTRIAL DISTRIBUTORS — SERVING INDUSTRY ECONOMICALLY — THE RIGHT HAND OF PRODUCTION

for fast, dependable service on all your industrial needs.

Patronize the Distributor who displays both.

CAPEWELL

THE CAPEWELL MFG. CO.
HARTFORD 2, CONN.

Letters...

To American Machinist
330 W 42nd St, NY 36, NY

Inspection-tool rental

Dear Sirs:
On your "Spot News" page (*AM*—April 6 '59, p99) there appeared a short paragraph concerning the rental of precision inspection instruments by the General Electric Service Shop in Detroit, Mich.

We are extremely interested in making inquiries in that direction and would appreciate your cooperation in furnishing us with the exact address of that facility.

James D Hatch
St Louis, Mo

Our information for this news item came from General Electric Co, Schenectady 5, NY. The company has a bulletin, GEA-6829, which contains full details of this service, so it would probably answer any questions you may have about it.—Ed.

Surface-plate check

Dear Sirs:
In many issues of your fine publication, I have found enjoyment, enlightenment, and dissapointment.

This latter reaction came to the peak upon reading an article entitled "Whitworth was only partly right" (*AM*—Apr 20 '59, p112).

Shame on you and Mr Rahn. You both should know better. In this generation of highly educated "brains," the vast majority of whom think they can lightly bypass the experience, principles, and diligence of those of foregone generations, a publication such as yours should take a firm stand against such attitudes.

It is obvious that Mr Rahn does not fully comprehend the Whitworth process, which seems rather surprising to me. Back in 1876, Mr Joshua Rose produced such flat plates (12 in. x 8 in.) that they nearly wrung together; required 34½ lb force to slide one on the other without lubrication. Makes us look foolish.

Fred E Haines
Wichita, Kans

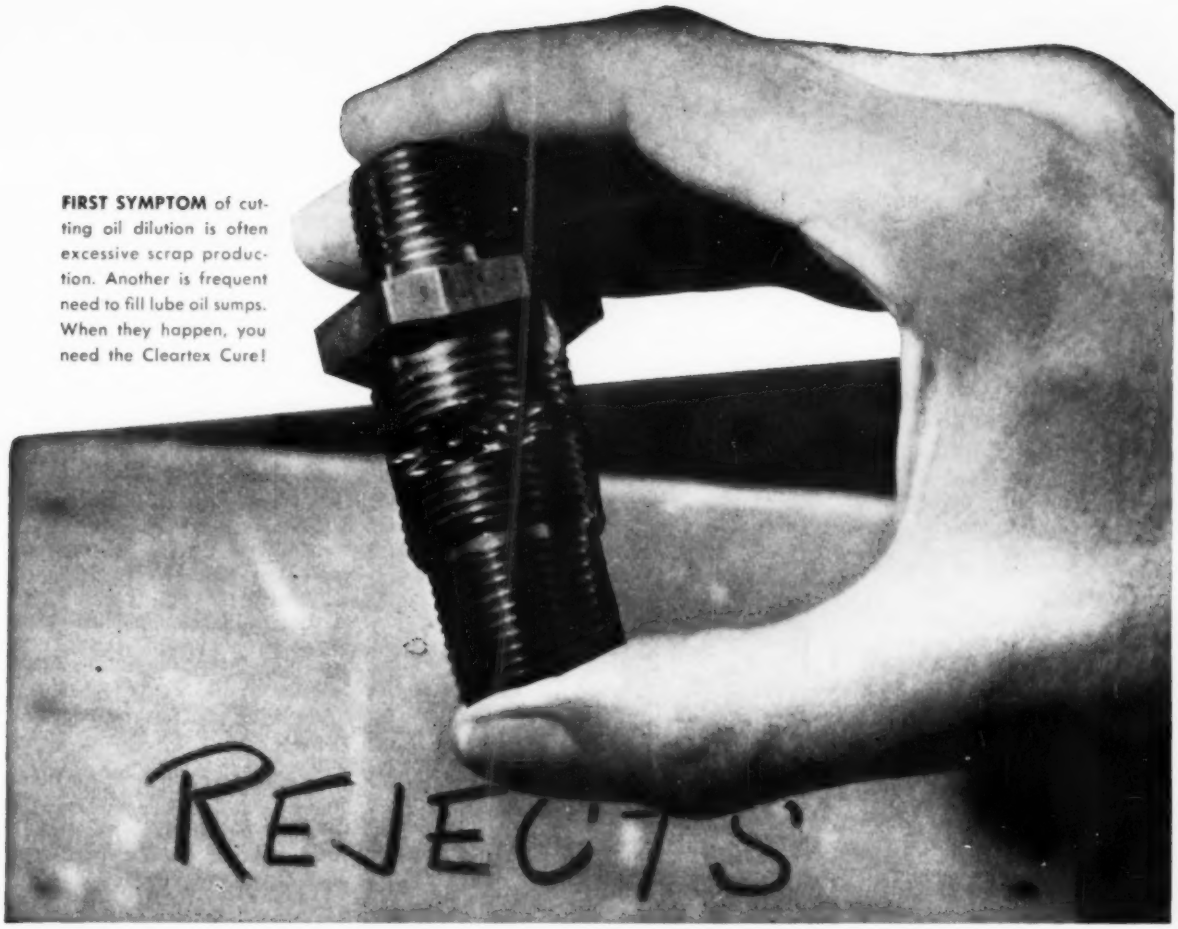
As Mr Rahn pointed out in his article, he worked three blocks of wood into a twist, and a strict application of the Whitworth principle did not show any flaw.

He even sent us a set of blocks

SHOPMATES

N. Jarvis

THE QUIETER IT IS, THE LESS NOISE YOU CAN MAKE — THE LESS NOISE YOU CAN MAKE, THE QUIETER IT GETS — AND IT SOON GETS SO QUIET YOU JUST CAN'T DO NUTHIN !!
SNIP
POWDER PUFF SILENCERS
ON THE OTHER HAND — THE NOISIER IT IS, THE LOUDER YOU ARE — AND THE LOUDER YOU ARE, THE NOISIER IT GETS !
N. JARVIS



FIRST SYMPTOM of cutting oil dilution is often excessive scrap production. Another is frequent need to fill lube oil sumps. When they happen, you need the Cleartex Cure!

Diluted cutting oil can pile up rejects

When you find your scrap production soaring, the villain may be lube oil leaking into the cutting oil sumps of your automatic screw machines. It happens in 7 out of 10 automatics in spite of the most careful lubricating techniques. This dilution will lower cutting oil effectiveness—and, as it loses its efficiency, rejects pile up, tool life drops, and production can go down by as much as 33 per cent!

Texaco Cleartex can solve the problem—forever!
Because of its exceptional stability and load-carrying ability, Cleartex can function *both* as a cutting oil *and* as a lubricant —and even as a hydraulic fluid. When *all* your automatics' sumps are filled with Cleartex, unavoidable leakage is no longer a problem. Excessive scrap production will stop, tools will last longer and production will go up.

TAKE THE "CLEARTEX CURE" SOON!
Write today for your copy of Texaco's new booklet—"Cleartex in Automatic Screw Machines." This new illustrated guide will fill you in on the details, show you where you may be losing profits and how to avoid it. Or contact your local Texaco Lubrication Engineer for an authoritative survey of your automatics. Just call the nearest of the more than 2,000 Texaco Distributing Plants, or write:

Texaco Inc., 135 East 42nd Street, New York 17, N. Y., Dept. AM-31.

LUBRICATION IS A MAJOR FACTOR IN COST CONTROL
(PARTS, INVENTORY, PRODUCTION, DOWNTIME, MAINTENANCE)

NOBLEWEST... ALWAYS AHEAD
WITH
BETTER MARKING
AT LOWER COST!

NOW...
NEW
DIAL FEED
MARKING
MACHINE

SPEED-MARKS 12,000 PIECES PER HOUR
. . . Automatically

Tooled for high production marking of small metal parts (12,000 pieces per hour), Model 347 illustrated above, is a good example of Noblewest's ability to keep ahead of industry's demands for constantly higher marking speeds at lower cost. Featuring a hopper and dial feed combination, parts are fed to the machine by the hopper, marked and automatically ejected. Spring pressure controls the depth of the mark and insures uniform depth of mark from piece to piece regardless of slight variations in diameter. Noblewest is equally famed for fine marking dies . . . made to the most exacting standards of quality and with the all-important skill and know-how of master craftsmen. Whatever your needs for marking, Noblewest makes the machines, tools and dies to do the job faster, better, at lower cost. For complete catalog write to Noble & Westbrook Mfg. Co., 17 Westbrook Street, East Hartford 8, Conn.

A Few Desirable Territories Open To Qualified Representatives

MARK IT BEST WITH NOBLEWEST IMPROVED MARKING DEVICES
NOBLEWEST
ORIGINATORS OF THE ROLL MARKING PROCESS
MARKING
NUMBERING
EMBOSSING
GRADUATING

showing the kind of twist that may develop if the Whitworth method is followed. Of course, he didn't say that twisted surfaces always develop with this method—just that they can.

Obviously, successful surface-plate manufacturers have found a way to avoid this particular pitfall, or they couldn't have become successful—Ed.

Slips that passed

Dear Sirs:
This is to tell you that we are all quite pleased with your handling of Mr Obrebski's article on high-quality cast iron (*AM*—May 4 '59, p104).

The author is a very thorough individual as you probably know. He has just called my attention to what appears to be a typographical error in the caption on the left at the top of page 105. The last sentence should read, "Hardness is 360 Bhn (200X)."

F W Pensinger,
The Monarch Machine Tool Co
Sidney, Ohio

Dear Sirs:
Just how fast do those electrons travel? Your article on electron-beam welding (*AM*—Feb 23 '59, p95) has it two ways.

In the text on page 96 you say "... 77 to 102 thousand mi per sec," and under the right-hand picture on page 97 you say ". . . as fast as 102 miles per sec."

Which is it?

L G Thompson
Pittsburgh, Penna

Sorry—we lost a few zeros on page 97. We meant to say 102,000 mi per sec in both places—Ed.

"I'll say one thing for our new foreman . . . he's got good discipline!"

CALENDAR

Drop Forging Association — Annual Meeting of Members, June 21-24, Essex and Sussex Hotels, Spring Lake, NJ.

American Society for Testing Materials—Annual Meeting, June 21-26, Chalfonte-Haddon Hall, Atlantic City, NJ.

Pressed Metal Institute—National Meeting, Sept 13-17, Stanley Hotel, Estes Park, Colo.

Society of Automotive Engineers—Farm, Construction, and Industrial Machinery Meeting and Display, Sept 14-17, Milwaukee Auditorium, Milwaukee, Wis.

American Die Casting Institute—Annual Meeting, Sept 15-17, Edgewater Beach Hotel, Chicago, Ill.

Instrument Society of America—Instrument-Automation Conference & Exhibit, Sept 21-25, Int'l Amphitheater, Chicago, Ill.

American Welding Society—National Fall Meeting, Sept 28-Oct 1, Sheraton-Cadillac Hotel, Detroit, Mich.

Society of Automotive Engineers—National Aeronautic Meeting and Display, Oct 5-10, Ambassador Hotel, Los Angeles, Calif.

American Society of Tool Engineers — Semi-annual Meeting, Oct 8-10, Chase-Park Plaza Hotel, St Louis, Mo.

American Society for Testing Materials—Pacific Area National Meeting, Oct 11-16, Sheraton Palace Hotel, San Francisco, Calif.

Magnesium Association—Annual Convention, Oct 19-20, Hotel Roosevelt, New York, NY.

American Institute of Electrical Engineers—Machine Tool Conference, Oct 19-21, Hotel Cleveland, Cleveland, Ohio.

American Machine Tool Distributors Association — Annual Meeting, Oct 25-27, Statler Hotel, St Louis, Mo.

American Gear Manufacturers Association — Semi-Annual Meeting, Oct 25-28, Edgewater Beach Hotel, Chicago, Ill.

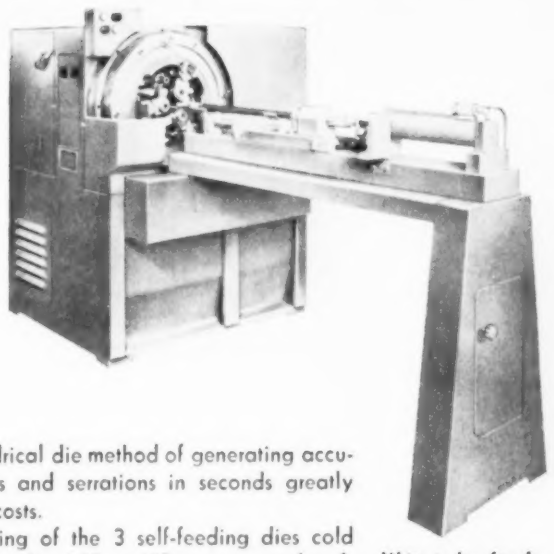
Reed 3-Cylindrical Die Machine

. . . produces splines faster with greater accuracy

It's Fast ...

It's Accurate..

It's a Money Maker ...



The Reed 3 cylindrical die method of generating accurate involute splines and serrations in seconds greatly reduces production costs.

The precise tracking of the 3 self-feeding dies cold forms the teeth with either 30° or 45° pressure angles. It gives greater tooth strength and better surface finish. The machine may be automated or equipped with a semi-automatic loading fixture.

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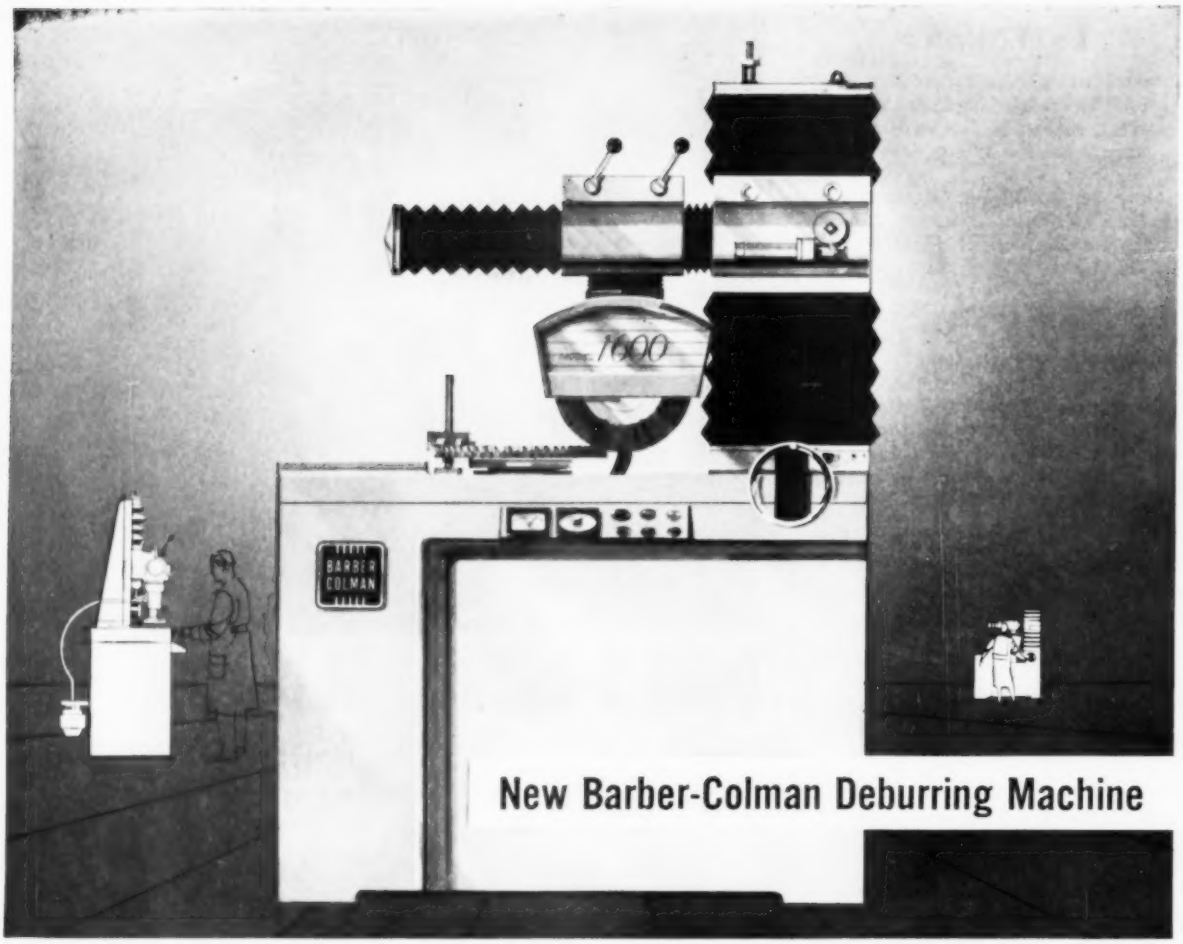

Fast, Efficient Gear Deburring

Deburring of spur and helical gears and sprockets is now fast, easy, and accurately controlled using a 3M "PG" wheel on the Barber-Colman Deburring Machine. This new method, developed by 3M Company and Barber-Colman Company, does not leave a burr on either the tooth profiles or the face of the gear. Also, it can grind a small chamfer on the complete tooth profile when required. Gears up to 16" diameter can be deburred on the Model 16)0 machine. For fine-pitch gears, a smaller machine using a 6" PG wheel will be available. The same process also can be applied to deburring of gears larger than 16" diameter.

This versatile machine is designed specifically for the deburring of gears and other toothed forms using the "PG" wheel. It is automatic cycling, and most gears can be deburred in a matter of a few seconds. The formed wheel, which is dressed easily on the machine, rotates in timed relationship with the work. After the first dressing, wheels require no further maintenance. The wheel is fed automatically into the work a predetermined amount during each cycle and is engaged with the work for a predetermined length of time. After the initial setup, the operator just loads and unloads the machine.

For further information, contact your nearest Barber-Colman representative or the factory. We will be glad to arrange a demonstration showing how this machine will deburr your parts.

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Newest and fastest of the Navy's fabulous nuclear submarines is the SKIPJACK, designed to carry out underwater missions in utmost silence. That is why the hushed quietness of Hoover quality ball bearings makes them the first choice for critical applications. Precision-made with super-smooth *Hoover Honed* raceways and perfectly matched sets of *Micro-Velvet* balls, Hoover ball bearings contribute to the quiet, enduring performance of a wide range of products.

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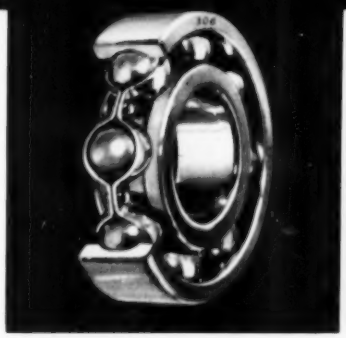

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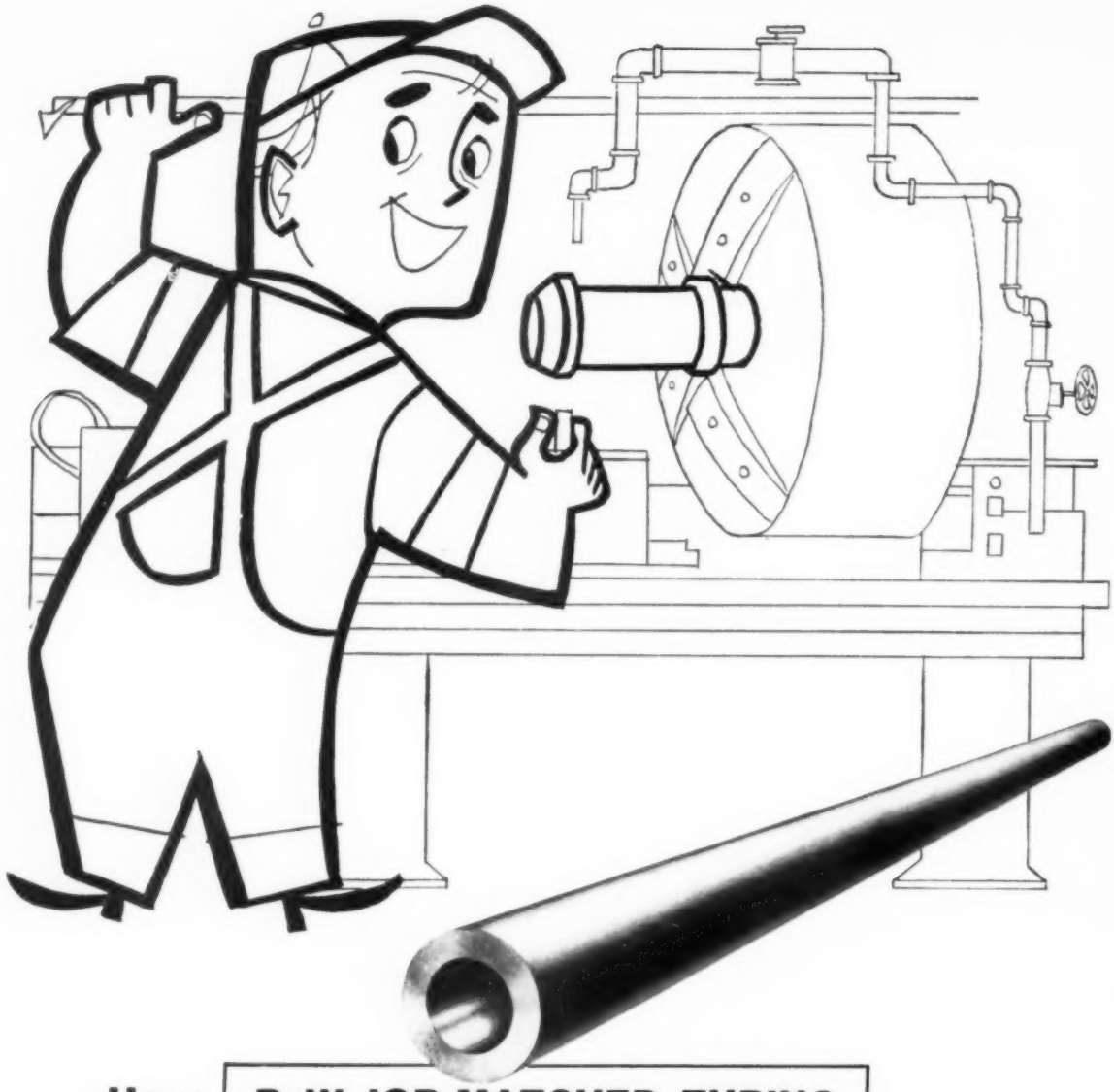

How B&W JOB-MATCHED TUBING speeds machining of precision parts

. . . Uniform close tolerances—require minimum machining to "clean-up."

. . . Controlled metallurgical structures—provide optimum machinability.

. . . Complete size range—permits choice of a tube size most appropriate for end use.

These are just a few reasons why it pays to specify B&W Job-Matched Seamless Mechanical Tubing for production of hollow precision parts. Call your local B&W District Sales Office, or write for Bulletin TB-340 for full information. The Babcock & Wilcox Company, Tubular Products Division, Beaver Falls, Pa.

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SPOT NEWS...

- **Largest beryllium forging to date** is a $90,000 piece 6 ft in diameter and 5 in. thick to be shaped into a bowl for McDonnell Aircraft Co's manned missile, Project Mercury. It was shaped by Alcoa on a 50,000 ton Mesta press, working from a slug that was hot-pressed and compacted in a vacuum by Brush Beryllium Co, Cleveland. Brush achieves substantially 100% of theoretical density with its compacting technique, and the reason for forging was to use the large press—far bigger than any Brush has available—to form final shape. Part was shaped with one stroke, now goes back to Brush for intricate machining.

- **Latest Soviet claim** is a "thousand meters of wire from a single drop of metal." A newly designed machine produces copper wire thinner than a human hair, with glass insulation less than a micron thick. The technique is to force molten nonferrous metal (or alloy) through capillary glass pipes of small wall thickness. High-frequency electric current melts the metal. The new process allows "pouring" wire less than 10 microns thick. Other metals for the wire are lead, zinc, and aluminum.

- **Glasrock, a promising ceramic material,** makes an excellent electric blanket brazing base, according to North American Aviation. The material does not warp and the exterior surface remains at room temperature at service temperatures up to 2000 F. Glasrock is reportedly being used as a standard for evaluation of ceramic material performance in the ceramics development program at Lockheed's Marietta Div. Material seems to hold great promise for reentry cone fabrication.

- **Aerospace Industries Association** reports that NAS Specification 936, covering standards for manufacture, performance, inspection and procurement of horizontal bed-type milling machines, is soon to be released. It will establish preferred relationships for close-tolerance milling of high-tensile, thermal-resistant materials.

- **How do you recover a manned space vehicle once it is up?** Space Recovery Systems, a joint venture of CBS Laboratories and M Steinthal & Co, New York, has been formed to develop recovery techniques. One contract calls for recovery of the 5½-ton Project Mercury booster. Firm will also explore methods of controlling the course of a space vehicle as it falls in a ballistic arc.

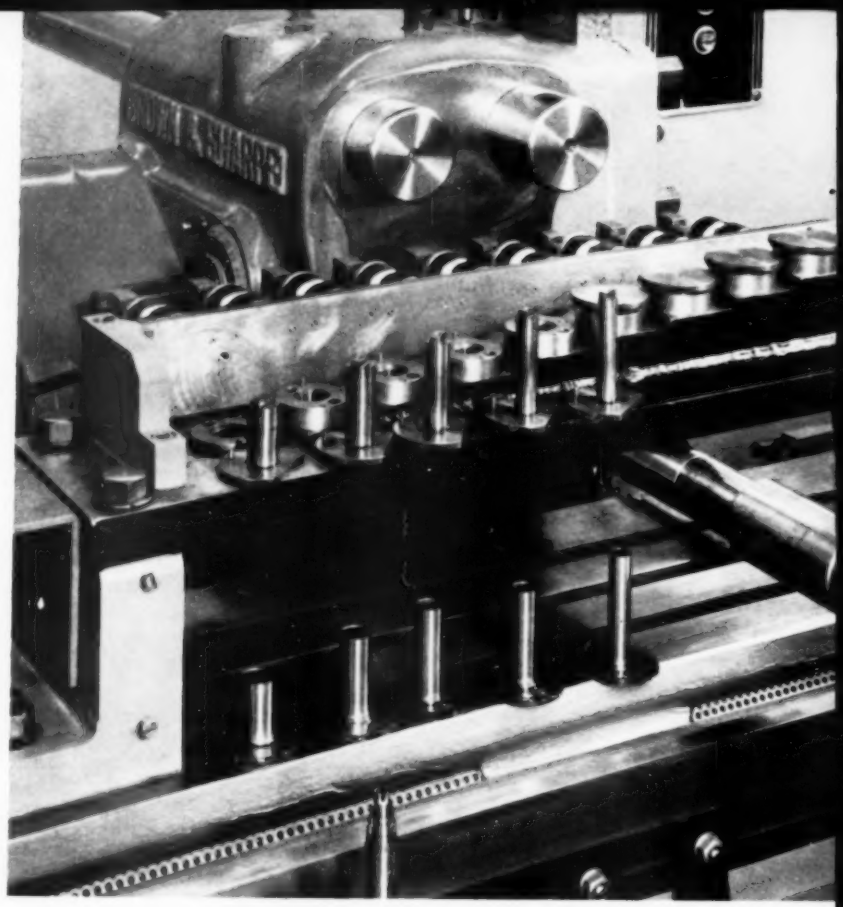
- **Boeing Aircraft is interested in "ablation"**—surgical removal of part of the body according to Webster—but Boeing means letting part of a missile burn away at high temperature in flight, leaving enough body to accomplish the job anyway. Best material, according to Boeing, is a resin—clear acrylic has been applied, but ablation can be controlled better if a filler is added. Idea indicates that different amounts of ablation can be planned, depending on flight plan.

- **A new small-business investment company** of San Rafael, Calif, plans to pay particular attention to extending loans and finance capital to smaller metal-fabricating firms in its area. The company, Marin-Sonoma SBIC, is the 13th to receive a license to operate from the Small Business Administration (see also Washington Trends, p97).

- **A 450-mph train** that slides through roller-equipped supports has been designed by a Japanese scientist. It is powered by four turbojet engines and is designed to carry 1000 passengers. The supports would be placed about every 100 meters along the route; the rollers would be rotating when the train reached the support.

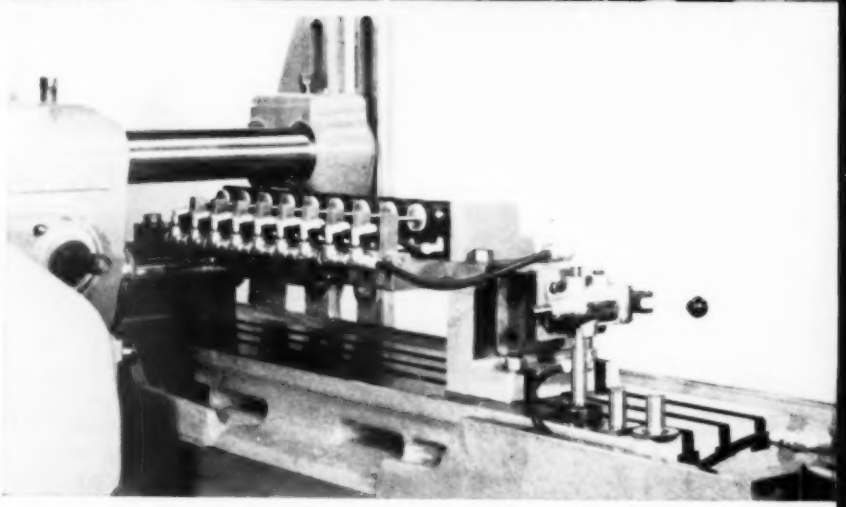
AT *National* CASH REGISTER COMPANY

Brown & Sharpe No. 12 tooled up for gang-milling thin-walled parts boosts production to 180 pieces per hour

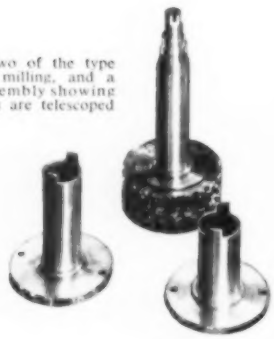


The bridge-type fixture holds type wheels, used in cash registers, while driving lugs are milled at the end of the thin-walled ($\frac{1}{32}$") sleeves. Filler plugs (shown on fixture) for each part (on table) support the sleeves against pressure of the cut. They also correctly position parts when dropped into the corresponding size bushing on the stepped fixture, which brings all sleeve ends in line. Two sets of plugs are used to permit filling parts while machine is operating. After fixture is loaded the parts are simultaneously air-clamped, with one lever, by split T-blocks at the base of each sleeve.

The cutter has extremely high rake and clearance, and is operated at 268 s.f.m. Chips drop down and away — permit fast, easy reloading. Table feed is 14" per minute. Production is 20 sets of sleeves (180 pieces) per hour.



BELOW — Two of the type wheels after milling, and a complete assembly showing how 9 sleeves are telescoped together.



PAYS TOP RETURNS IN PRODUCTION PER DOLLAR INVESTED

Special fixtures on the standard B&S No. 12 Plain Milling Machine can give you the high-speed production advantages of an expensive single-purpose special machine. At a moderate cost, you can automate present operations, and get basic milling equipment that can be easily converted for revised operations, or other jobs.

Brown & Sharpe specialists in fixture design will survey your operations and make recommendations at your request. Make you investment in milling equipment pay the highest return in savings. For complete information, write: Machine Tool Division, Brown & Sharpe Mfg. Co., Providence 1, Rhode Island.

Brown & Sharpe PRECISION CENTER

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WASHINGTON...

Tax outlook...

There's a fighting chance for some corporate tax relief next year. The Democratic Congress is expected to vote some individual tax relief as a sort of election-year boon to the individual. There will be a strong bipartisan effort to cut business in for some tax breaks as well.

Talk about a Democratic drive this month to vote a two-year extension of the 52% rate on corporate income turned out to be nothing more than just talk. Congress will come up with the customary one-year extension of the 52% rate, imposed during the Korean War as a "temporary" measure. The maximum rate, if the Korean bump were allowed to recede, would be 47%.

New tax aid...

Small-business investment companies may be getting another tax break. These are the new federally-chartered "banks" which are given certain tax benefits for making long-term loans or investments in small business. About a dozen of these companies have been licensed by the Small Business Administration—from Boston to San Diego . . . and many more are expected.

One idea is to exempt from taxation 15% of interest income of such companies from loans to small borrowers. Another would let the investment companies set aside tax-free reserves. As of now, experts say, the most important tax benefit the capital banks enjoy is the favorable tax treatment they get on losses they sustain.

Renegotiation extension pushed...

Four-year extension of the controversial Renegotiation Law is being pushed through Congress. The House has approved a bill renewing the act with little of the liberalization sought by military producers. The bill simplifies contractor appeals from excessive profit determinations, but fails to allow the much-sought exemption for incentive-type contracts. The Senate has started hearings on the measure; seems certain to pass the bill as it stands now. The Pentagon goes along with the latest provisions.

Army looks to new hardware...

Extra procurement funds tacked on to the Army's appropriation by the House (see Aircraft & Missiles, p101) will go mostly to buy arms already in pilot-line production. This assumes the administration allows the Army to spend the extra money. But the Army also would like to get started on design and construction of prototypes for a whole new generation of armored vehicles.

Most serious plan is for a light-weight, high-speed tank armed with the beam-riding "Shillelagh" missile. This tank will probably be built of aluminum, will weigh about 40% less than the new 52-ton M-60 just going into production, and will be about one-third the M-60's size.

Looking further ahead, Army planners envisage nuclear-powered tanks; tethered turret tanks; tanks with clusters of "Kamikaze Pods"; and armored vehicles which can fly, move on the ground, or navigate under water.

Procurement trends...

Most up-to-date Defense Dept figures play up the military-procurement trend toward cost-reimbursement type contracts in general and the use of incentive clauses when fixed-price types contracts are still awarded.

Of the $22.2 billion worth of production business placed last year, almost 40% of the total contracts were cost-reimbursement types—most with fixed-fee provisions. The year before, only 33.4% of the total dollar volume was covered by such contracts. Defense experts say the rate rose this year and will continue in fiscal 1960.

The remaining 60%—all fixed-price types—includes a large chunk still with firm price provisions. But an increasing percentage contained incentive clauses, under which the contractor is allowed to increase his profit by trimming costs, speeding delivery, or improving performance of the equipment.

Depreciation...

A united front by businessmen on tax depreciation policy is being sought by leaders of the machine tool, railroad, steel, and other industries. The first step was a meeting in Washington (June 11) sponsored by the Tax Committee of the U S Chamber of Commerce. Joel Barlow, chairman of the committee, was in charge.

A leading topic at the opening session was the drive to have replacement value used as a depreciation base instead of original cost, as the present law requires. The long-discussed revision of Bulletin F was also considered. The practice of some revenue agents in insisting on longer useful lives for tax purposes if accelerated depreciation formulas are used, was cited as the type of thing that all industry groups can unite in opposing.

How a leading automotive manufacturer Snyder-izes for the Soaring Sixties

HOLDS PISTON WEIGHTS ± 2 GRAMS AT 600 PER HOUR

This Snyder transfer machine automatically weighs die cast aluminum pistons and mills them to tolerances of ± 2 grams at double the rate of the previous method. Here's how it turns out 600 parts per hour:

Pistons are transferred bottoms-up to orienting station.

Pistons are oriented in relation to the wristpin hole offset.

Pistons are spun right side up (below at right) while they are advanced to weighing station.

Precise overweight is transmitted by memory system to weigh-mill station during transfer.

A 3¼" milling cutter removes excess with the piston clamped in position.

Gaging station re-weighs pistons to check weight. Deviation from part tolerances stops machine.

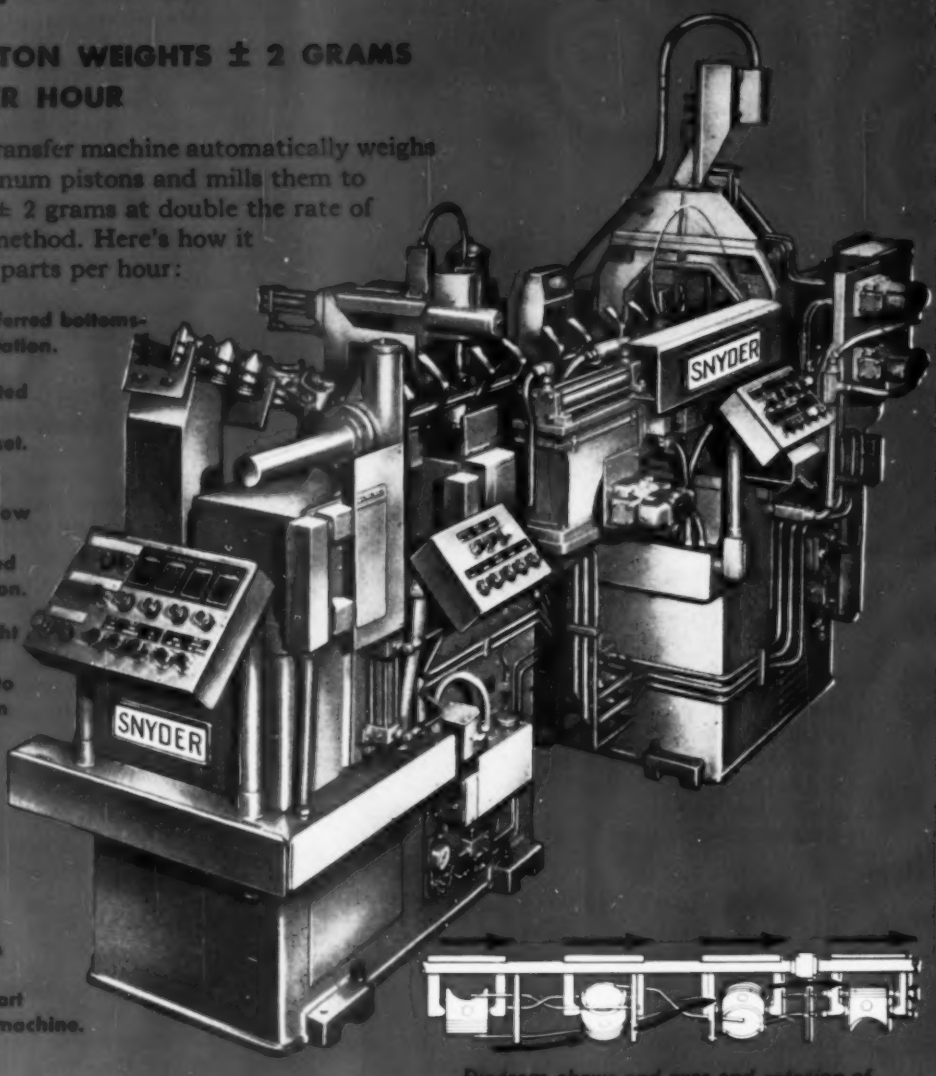

Diagram shows end over end rotation of piston as it passes through spiral rails.

Do your manufacturing cost problems revolve around parts handling, gaging and assembly as well as machining? Ask us to show you the benefits of SNYDER-IZING FOR THE SOARING SIXTIES. For a resume of SNYDER special machines engineered for profit opportunities, send for our new brochure or phone.

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DETROIT...

Production holds steady...

May closed out with 547,326 cars, 112,660 trucks, and 375 motor coaches produced for that month's third best total in history. June schedules call for a slightly higher pace of about 550,000 cars, which would make it fourth best.

Only factors standing in the way of a sure 6-million-car production year are the ominous steel and tire negotiations. Carmakers will have stockpiled enough steel by the July 1 strike deadline to insure filling dealer pipelines with 1960 models, but they may have underestimated the stubborness in Akron.

Many observers here suspect that a few makers are solving steel stock problems by converting excess inventory into finished cars. In this way, dealers are forced to shoulder the costs. Floor-plan financing alone costs $20 per unit a month, not to mention storage charges. On this basis, Automotive News' June 15 estimate of a record 905,000 cars and 100,000 trucks in inventory makes sense.

Studebaker comeback...

Everybody knows the startling success story of the "common sense" Lark, which is still humming off the South Bend lines at the rate of 84 units per hour, but few outside of the company's 16-man administration committee know the tooling facts behind it.

Purchasing Director John Soelch recently told AMERICAN MACHINIST a few of them. In the dark days of January 1958, Styling had just finished rehashing the obsolete line of Champions, Commanders, Presidents, Hawks and Packards in the not-too-certain hope that there would be use for 1959 models. The Lark at that time was nothing more than an idle sketch on a piece of paper.

By March the others were dumped and the Lark was it. Soelch says "We worked 24 hours a day, Saturdays and Sundays." As soon as Styling completed clay models, vendors were brought in to work directly from them. Their cooperation with Styling, Engineering, Manufacturing and Purchasing was critical to keep costs down. Budd, which supplies body stampings, figured a way to use a single roof to fit two- and four-door sedans as well as the hardtop. Another supplier helped Styling work out a bumper that was interchangeable front and rear. An electrical manufacturer suggested a simple socket relocation so that taillamp assemblies would also be interchangeable.

But perhaps the biggest single cost-cutting idea came from Soelch himself. Though Budd has been the historic supplier of body stampings and tooling, the company usually farmed out fenders, hoods, and other miscellaneous items to several other tool makers.

Why not, Soelch asked himself, give the whole works to one supplier so that engineering changes (there turned out to be over 200 of them) could be coordinated under one roof? He bounced into President Harold Churchill's office with the idea, got an ok at that sitting, and Budd estimators were in South Bend by evening.

Their estimates were in line. The result was that when Budd delivered the first 100 car sets of stampings on pilot day in September, those 100 cars rolled off the line on a regular production schedule. This has never been done before or since in the industry.

Studebaker today is a happy factory, a place where empty desks are a sign of health. The obese structure inherited from Packard is down to what Churchill likes to call "the lean, hard core." For example, Soelch's purchasing department of 31 people, including stenographers, will in 1960 buy nearly $150 million of tools, materials and supplies. He didn't tell us this, but we happen to know that the Lark was tooled at a total cost of $4.5 million. It couldn't happen in any other company nowadays.

Diesel beachhead...

Within three years Checker Cab's 900-car fleet in Detroit will be completely dieselized. That is the flat statement made to AMERICAN MACHINIST by the company's cash-in agent, Charles Ross.

"1955," he said "was the company's last good year. Last year we operated at a loss." From initial experience with 11 diesel units now in operation, he estimates that savings will run to about $800 per cab, despite the higher initial ($750 vs $250) cost of the engine.

Checker is currently using an English four-cylinder Perkins engine installed in otherwise standard Plymouth and Chevrolet cabs. Though pump costs of diesel fuel and gasoline are about the same, the diesel units average up to eight miles more per gallon in traffic.

Detroit Diesel Division of GM is taking a long look at the cab market. It plans to buy a Checker-made cab (no relation to the operating company) and install one of its new three-cylinder engines for proving ground tests.

...see how this new ROTOR PENCIL GRINDER excels all others

- **THE FIRST BLADED TYPE AIR-POWERED PENCIL GRINDER** . . . now vastly improved . . . the New Rotor M1223 D-03S. Features:
- **NEW FULL-GRIP COLLET.** "Rubberflex" collet grips shank entire ½" length. Takes wider range of shank tolerances. Holds shank concentrically . . . minimizes "runout" to .002", reducing vibration, prolonging point and cutter life.
- **FRONT EXHAUST** . . . away from operator. Keeps work clean. Collet shrouded by exhaust deflector. (Side exhaust optional.)
- **STURDIER CONSTRUCTION.** Rugged, one-piece spindle and ball bearings of ample size assure long life, smooth operation, reduced "runout". Splined drive of rotor to spindle is stronger, gives better dynamic balance.
- **MORE POWERFUL BLADED MOTOR** (not a turbine). Full 40,000 rpm gives plenty of power for ½" diameter mounted points and burrs, or cutters. Greater power under load for higher cutting efficiency.
- **TRY IT!**—ask for free demonstration of the New Rotor M1223 D-03S Pencil Grinder!

Optional end cap with side exhaust (arrow).

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AIRCRAFT and MISSILES...

TRENDS

House reshuffles defense budget...

$85 million extra has been voted to the Air Force by the House Defense Appropriations Subcommittee for expansion of the Atlas ICBM force from the nine squadrons planned to 17. It also has voted for fiscal 1960 an added $87 million to speed research and development work on the solid-fueled Minuteman.

The Army apparently is to be allotted an extra $200 million for advance procurement of components for the Nike Zeus anti-missile missile project and for stepped-up development of the missile and its ground-support gear. But the House Committee steered away from a clear-cut proposal to tool up for volume production of the Nike Zeus.

The Committee has done some fancy slashing of 1) one-third of funds of Air Force for making the Bomarc missile ($284.6 million still is left); 2) $53 million from Air Force for 10 jet cargo planes; 3) $127.5 million from Air Force for continued production of the Mace missile.

Army's procurement fund for the Nike Hercules, incidentally, came out of the House untouched.

The House bill approves plans for 70 more B-52 bombers, 40 more B-58 supersonic medium-range bombers, 96 KC-135 jet tankers, and further development of the B-70 long-range supersonic bomber.

Jet transports uncertain...

Airlines have asked the CAB for a 15% fare boost to finance $2- to $3-billion worth of jet planes and equipment to be purchased by 1963; and Hearing Examiner Ralph L Wiser has recommended a fare increase of 1.9% over current rates. Present rates are 12% over permanent rates in effect more than three years ago when the case began.

But the five-man CAB may not accept the recommendation on the grounds that higher fares will drive away the mass market that must be tapped to fill jet-airliner seats to get them on a paying basis.

New name for AIA...

Aircraft Industries Association is changing its name to Aerospace Industries Assn to cover "research, development, and production" of manned and unmanned vehicles for "movement above the Earth's surface." General Orval R Cook, president of AIA, also forecasts continuing strong markets for aircraft, especially helicopters, VTO's, and manned space vehicles; increasing industry payroll, increasing percentage of scientists, engineers, and technicians in the industry; and fewer major weapons systems in large-scale production.

Something's got to give...

Jets have been forcing longer and longer airport runways, but General Quesada, FAA chief, thinks privately they've gone about as far as they can. From now on, he believes, planes will have to adapt to existing airports. This means planemakers will have to design new models to get into present runways—and take off from them with full loads, too.

West Coast outlook...

Backlogs are steady around Los Angeles. Douglas has about $11.2 billion, half military, half commercial, with missiles accounting for half the military. Douglas' first DC-8 jet liner was delivered to United Air Lines June 3—with 40 to follow. There are 140 DC-8's on order; no large orders this year.

Employment is dropping slowly at Douglas from 72,000 to 70,500 in six months, and the decline will continue through the year. Best future hope is in missiles—but well in the future. Nike-Zeus development is nearing completion, but large-scale production is at least a year off. Douglas also has hopes for its air-launched ballistic missile.

Northrup backlog dropped from $264 to $235 million in the past year, 68% of it currently in missiles. The company is going through an economy program, and employment is down 10% from a year ago. Another 1400 people will be laid off by August. Future orders lean heavily on Northrup's T-38 trainer and N-156 lightweight NATO-SEATO jet fighter.

North American expects more business in this half of 1959; plans to add 1000-1500 people. Manned aircraft account for 67% of the company's business, with B-70 and F-108 the major units. Rocketdyne Div is busy turning out engines for Thor, Jupiter, Atlas, and Discoverer shots, as well as the GAM-77 missile. Other divisions are producing inertial navigators and power reactors.

Lockheed also looks for a good second half, perhaps 5% up from the first half, and about 20% up for the year over 1958. Employment should drift up especially in missile sections. Orders are booked for 163 commercial Electras and the company has a pre-production Navy order for the anti-submarine version of the Electra.

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Cushman air operated

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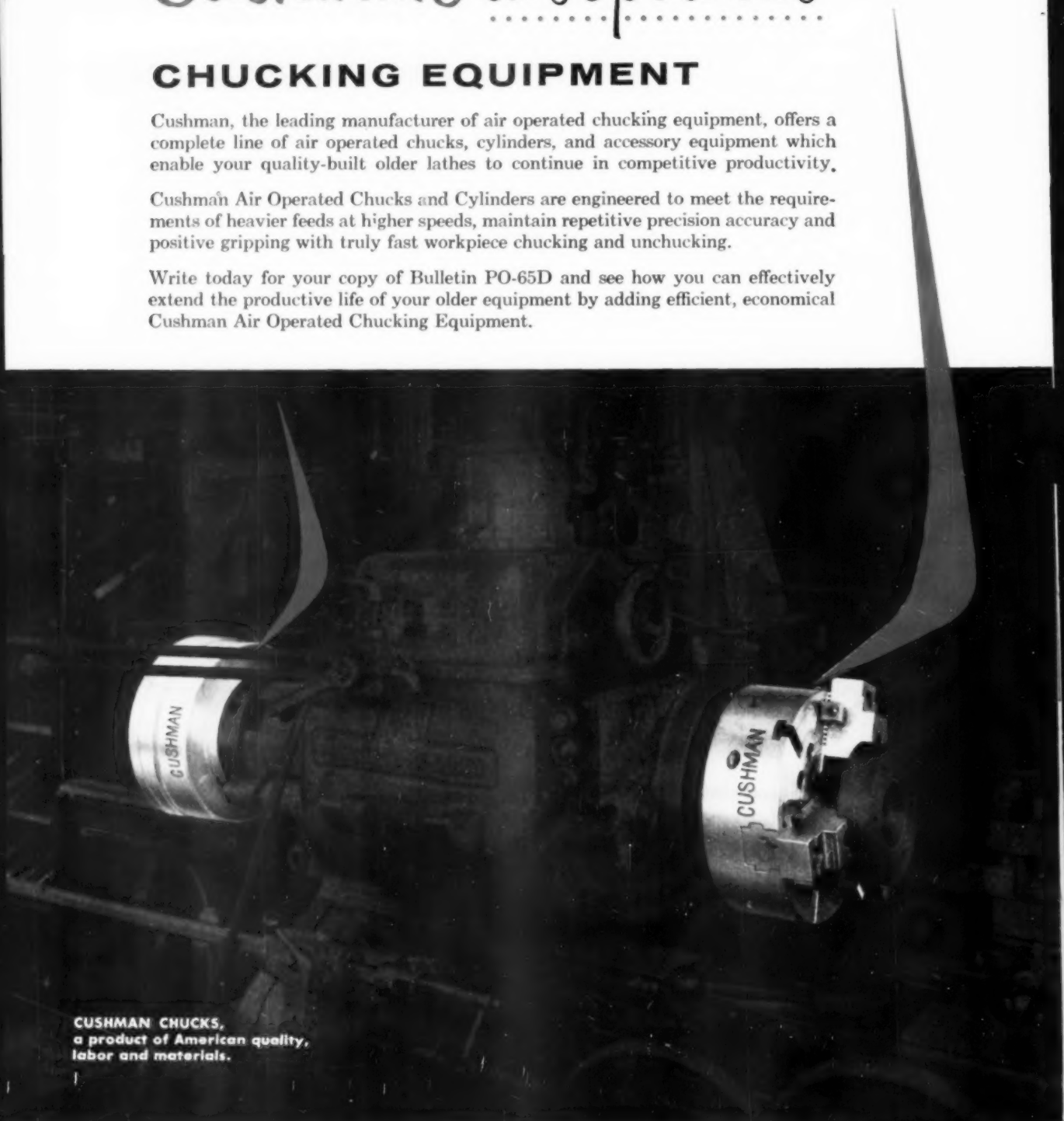
Cushman, the leading manufacturer of air operated chucking equipment, offers a complete line of air operated chucks, cylinders, and accessory equipment which enable your quality-built older lathes to continue in competitive productivity.

Cushman Air Operated Chucks and Cylinders are engineered to meet the requirements of heavier feeds at higher speeds, maintain repetitive precision accuracy and positive gripping with truly fast workpiece chucking and unchucking.

Write today for your copy of Bulletin PO-65D and see how you can effectively extend the productive life of your older equipment by adding efficient, economical Cushman Air Operated Chucking Equipment.



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a product of American quality, labor and materials.

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MACHINE TOOLS...

Orders for '61 tooling to begin . . .

The first tooling orders for 1961 models to be introduced in the fall of 1960 are about to be placed with machine tool builders.

These orders will be for machines for the engine, axle and a new small transmission of the so-called compact car to be marketed by General Motors in the Buick-Olds-Pontiac divisions.

Don't confuse the compact car with the small cars to be brought out this fall. The compact cars are to be smaller versions of standard cars, but considerably larger than the Corvair, the General Motors entry in the small-car field.

Buick now has a V-eight engine with aluminum block for the 1961 compact car. Engine and axle part drawings are at the machine tool builders.

Detroit Transmission has given blue prints of a new small transmission for this car to builders.

Orders are likely to flow before long, because Buick is said to want first-of-the-year deliveries so that there will be plenty of time to get production rolling for cars to be marketed in the fall.

Ford increases Falcon schedule . . .

Ford is said to have revised upward its production capacity for engines for its small car, the Falcon. It expects to be able to turn out around 150 engines an hour, compared with the original plan for 75. It appears unlikely that Ford intends to put this engine into any other line than the Falcon. There is no intimation as yet that the capacity for manufacturing automatic transmissions will be increased.

There is considerable speculation on what will happen if the small cars are a big success. The production facilities for making them obviously will be enlarged. But the Big Three are not expected to rush in with further investments until they are sure of the market. The earliest that any more tooling orders can be anticipated is believed to be the first quarter of 1960.

Demand for machine tools by European automobile companies is reported active. Relatively, more machine tool business is breaking there than here. But only a very small percentage of the total is being placed with U S builders. The competition for this business is severe, with more and more European builders offering special and high-production machines.

Missile makers order tools . . .

A substantial portion of orders booked by many machine tool builders is coming from both West and East Coast aircraft and missile makers.

The main reason is that these makers are in need of precision equipment that will handle satisfactorily work being done to closer and closer limits.

Several machine tool builders are producing elephant machines of new and special design for companies in the missiles industry.

Missile makers are expected to continue to be a fairly lucrative source of machine tool business in the months ahead.

Industrial heating survey . . .

For purposes of mobilization planning a survey of the facilities of the industrial heating equipment industry is now being completed by the Metalworking Equipment Division, Business and Defense Services Administration, Department of Commerce.

European Show September 12-21 . . .

The sixth European Machine Tool Exhibition will be held in Paris next September 12 to 21 inclusive. The show, now put on every two years, will be staged in a new modernistic building in the Paris suburb of Seine, with all exhibits under one roof.

Available floor space is considerably less than at previous shows at Hanover, Brussels and Milan.

There will be around 900 exhibitors, with Germany representing the largest single segment (as it has in previous shows). The British are reported to have considerably more space than in the past, in proportion to the total. Only U S machines on display will be those built in Europe by subsidiaries of U S companies or by licensees.

European joint survey abandoned . . .

Organization for European Economic Cooperation (OEEC) has abandoned the idea of making a survey of the machine tool population of the 17 member countries, as proposed earlier in the year. Reason: lack of funds. Machinery Committee of OEEC, however, is likely to put together a questionnaire and an outline of procedure that could be used as the basis for surveys in individual countries. The method employed by AMERICAN MACHINIST in taking its Five-Year Inventories probably will serve as an over-all guide.

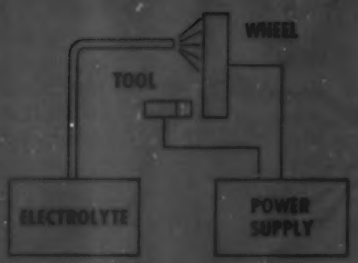
B.F.

NEW

Reciprocating Electrolytic Tool Grinder

MICRO-FINISHES CARBIDES, CUTS DIAMOND-WHEEL WEAR 80%

59-25



ELECTROCHEMICAL METAL REMOVING "LETS THE ELECTROLYTE DO THE GRINDING"

As conductive, metal-bonded wheel reciprocates across face of tool, inexpensive salt-solution flows between the tool and the wheel, creating electrolytic cell; the tool becomes the anode. Material is removed essentially as in a depleting process—but at much higher speed—leaving burr-free finish.

Because its reciprocating wheel just "wipes away" the carbide particles, Ex-Cell-O's Style 264 Electrolytic Tool Grinder reduces diamond wheel consumption by as much as 80 per cent! With one set-up, tools can be precision-finished to better than 15 micro-inches—free from heat checks, cracks or burns caused by abrasive contact.

The Style 264 grinds the cutting edges of carbides and other super-hard tool materials at one end, grinds chip breakers at the other. Wheel stroke is fully adjustable. Standard equipment includes: Ex-Cell-O Precision Spindle with inbuilt reversible motor, universal chip breaker fixture (shown in circled inset, above), and pressure system for electrolyte.

Write direct, or see your Ex-Cell-O Representative for details on the Style 264, conventional Style 142 Reciprocating Tool Grinder, and others in the complete Ex-Cell-O line.

EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN

XLO
EX-CELL-O FOR PRECISION

Machinery Division

EX-CELL-O PRECISION PRODUCTS INCLUDE: MACHINE TOOLS • GRINDING AND BORING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • TORQUE ACTUATORS • THREAD AND GROOVE GAGES • GRANITE SURFACE PLATES • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

CIRCLE 265 READER SERVICE CARD

MATERIALS...

Pittsburgh Steel versatilizes . . .

With oil-field equipment taking 17% of its product and the automotive industry taking a slightly higher percentage, the Pittsburgh Steel Co is developing a nicely diversified market for its wire, strip, tubing and sheet products. Emphasis is on specialty products to meet distinct industry needs, such as the recently developed patterned sheet (p 117).

Recently the company announced completion of an eight-year, $111 million expansion and improvement program. First phase in the program was construction of new hot and cold sheet mills at the Allenport (Pa) Works, to help the company enter new markets. More recently, complete rebuilding of blast furnaces and open hearths, including the addition of oxygen equipment to some of the latter, has made these basic units among the most modern in the country. Capacity and productivity are increased.

Among other improvements, is a new 46-in., high-lift blooming-slabbing mill. This 7000-hp mill can make either blooms for conversion into bars, billets or tube rounds, or it can (through the high-lift rolls) produce slabs for conversion into sheets. A sorter-conveyor system directs slabs to flat cars for shipment to the hot and cold sheet mill. Blooms go to the new 30-in. billet mill, where they are reduced to billets or tube rounds, as required.

Three horizontal and three vertical stands, individually powered by 1750-hp General Electric motors, make up the new six-stand continuous billet mill. Blooms can be rolled from an original 8 by 8 in. to 9¾ by 12¾ in. down to various sized rounds from 4⅝ to 7⅝ in. dia. The mill rolls 4-in.-square billets for rod mills, too. With 8259 employees, the Pittsburgh Steel Co now has an annual ingot capacity of 1,560,000 tons.

"Mines" in the slag heaps . . .

The mountains of slag so common in iron and steel communities are being explored by a new type of "miner." Trucks, power shovels, and magnetic cranes are hard at work recovering iron-bearing slag previously considered impractical to separate. Now, new chemical reduction techniques and better separation methods make recovery of this iron worthwhile.

Space-age steel piloted . . .

At its South Works in Chicago, the United States Steel Corp is pilot-plant testing, under steel mill conditions, research projects that originated at the US Steel Research Center in Monroeville, near Pittsburgh. Two of the processes being tested are multiple-vacuum casting and consumable-electrode-furnace melting.

A giant consumable-electrode vacuum melting furnace (*AM*—May 18 '59, p109) is capable of producing ingots up to 32 in. dia and weighing 20,500 lb. Another application of vacuum is found in a new multiple ingot casting process. Inside the equipment base there is a huge turntable (lazy susan) on which are placed seven ingot molds. A vacuum tank, 16 ft in dia by 14 ft high, covers the molds. A special 30-ton ladle is placed on top of the tank.

Then, with a four-stage steam-ejector system, the casting unit is evacuated to an absolute pressure of about 200 microns—40 times the pressure in the more critical consumable-electrode process but still highly rarified. A heat of steel to be vacuum cast is tapped into a conventional ladle. Then the heat is poured into the special 30-ton ladle on top of the tank. As the molten metal passes from the ladle through the vacuum tank and into the ingot molds, it is degassed. As each mold is filled, the turntable is rotated to position the adjacent empty mold to receive the molten steel. (It has been said that as much as 85% of our annual steel production may be degassed by some vacuum method.)

Other processes being tested by US Steel include its new Nu-Iron ore reduction method. In a fluidized-bed reactor, a bed of finely divided iron ore is suspended by a rising stream of reacting gas, such as hydrogen or carbon monoxide, at an elevated temperature, which reacts with the ore to reduce the oxide and produce iron. It avoids the need to agglomerate finely divided ore into large lumps for the blast furnace and, by using reducing gas, does not require high-grade metallurgical coke, as does the blast furnace. Gas passing through the powdered ore causes it to appear as a bubbling, boiling fluid.

Titanium for anodizing racks . . .

Titanium is replacing aluminum in the racks used to hold parts during anodizing because it requires little or no maintenance, has excellent corrosion resistance and, in its anodized form, is a satisfactory electrical conductor. The anodic coating also protects it from attack by sulphuric acid. Mallory-Sharon Metals Corp, Niles, Ohio, says it has received a large order for commercially pure titanium from Carlson-Erie Co, Erie, Pa. The latter company has designed and will fabricate the racks with the assistance of Mallory-Sharon metallurgists and engineers.

JONES & LAMSON MACHINE TOOLS

the man who needs a new machine tool is already paying for it

Brand-new! A fully automatic tracing lathe

This new J & L Model 30 Fully Automatic Tracing Lathe combines a number of flexible designed features, *and it's competitively priced.* The basic J & L ingredients of extra ruggedness and extreme precision are apparent throughout. (Note the unusual solidness of the tracing slide, for instance.) Specifically, it offers 1. *Fast and flexible set-ups* which are extremely simple, and accessible to the operator, 2. *Compact and convenient controls* for push-button programming of the automatic cycle, 3. *Automatic speed and feed changes* during a cut, 4. *Work handling facilities* that can be either automatic or manual (there's plenty of room for chip disposal, too).

In addition, this machine will accommodate any one of three different rear slides. It also offers a choice of two different headstocks. Moreover, the stylus and template are high and dry.

Details and specifications are contained in our brochure No. 5810. Write for your copy. Jones & Lamson Machine Company, 502 Clinton Street, Springfield, Vermont.

Turret Lathes • Automatic Lathes • Tape Controlled Machines • Thread & Form Grinders • Optical Comparators • Thread Tools

WHAT'S AHEAD... in Metalworking

TRENDS

Strike will be only minor setback in upward swing

Though the metalworking industry has recovered most of its recession loss in rate of operations and is heading for new high ground, its production is bound to be affected adversely by a steel strike.

Little if any effect would be felt in the opening weeks of a strike. But many manufacturers are poorly prepared, from the standpoint of steel in hand, to weather a long steel shutdown. Much of the tonnage that they ordered as a strike hedge has been chewed up in actual production.

Automobile makers probably are the best prepared of all for a strike. They have orders in at mills for steel for 1960 models as well as for a cleanup of current models.

Strike or no strike, the fourth quarter looks good and metalworking production this year is sure to show a substantial gain over last year.

McGraw-Hill Index of New Orders for Machinery has hit an all-time high. April was 13% above March and 40% above last year. The big upswing was in general-purpose and special-industry machinery.

Farm equipment sales continue on the upgrade, with makers in the midst of a seasonal drop that will be succeeded by a good demand in the fall. While farm incomes are down, farmers are still spending more for equipment. Inventories in the field are pretty good. Equipment manufacturers are short of tractor tires, with the situation getting worse before it gets better. The industry also has only a few weeks' backlog of steel and cannot operate long in case of a steel strike.

Electrical appliance sales are improving steadily. Main trouble is that production has been running so high that many makers have not been able to accumulate the supply of steel that they had expected. They would like a 45 days' stock of steel on hand July 1.

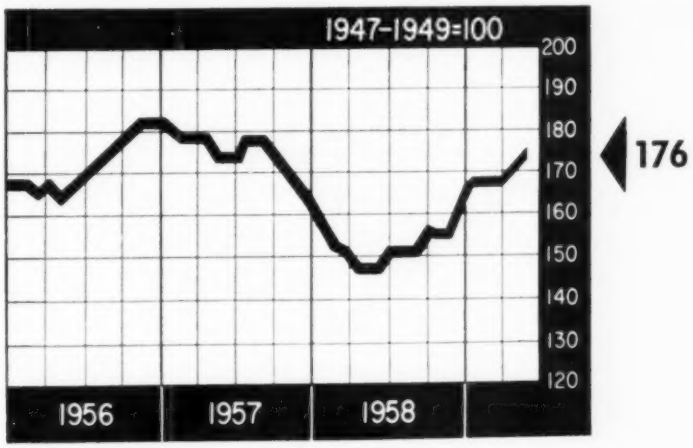
Refrigerators are doing exceptionally well. So are washers. Ranges and dryers are off a bit.

Railroad equipment people report that this year is a lot better than last, but far short of being a boom. One company says that railroad buying "is more than just a flurry and our backlog has been going up." Another builder, however, indicates that railroads are holding off ordering equipment until the steel situation is resolved.

A broad upturn has occurred in the commercial stamping industry. Orders are pouring in from all over, but electronic, farm and garden equipment, houseware and business machine manufacturers are the most active customers. A prolonged steel strike would play havoc, however.

The bearings industry is in the midst of a strong demand closely resembling a boom. Third quarter looks as good as the second, barring a strike of more than two months. Companies that normally have been closing down for two-weeks' vacation intend to work straight through the summer this year. One maker has experienced a spectacular gain in sales of railroad bearings.

Aircraft parts business has leveled off with signs that it is likely to stay at about the current rate for some time ahead. Says one maker, "this year has marked the end of the big decline that started back in 1957."



AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

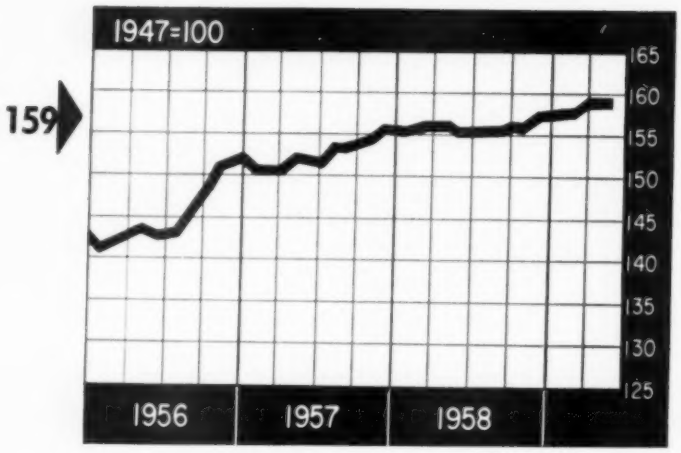
	MAY Estimated	APR Preliminary	MAR Revised	APR Year Ago
Total Index	**176**	**174**	**170**	**146**
Machinery	144	141	123
Electrical Machinery	200	194	166
Autos	133	132	86
Other Transportation	353	338	336
Other Metalworking	149	146	128

TRENDS

WHAT'S AHEAD... in Business

AMERICAN MACHINIST INDEX OF METALWORKING PRICES

	MAY Estimated	APR Preliminary	MAR Revised	APR Year Ago
Total Index	**159.0**	**158.9**	**158.5**	**155.9**
Metalworking Machinery	184.1	183.8	182.3	
Other Machinery exc. Electrical	169.6	169.8	166.0	
Electrical Machinery	159.3	159.4	157.5	
Fabricated Metal Products	148.8	148.7	146.6	



Is tight money coming?

For the second time this year the Federal Reserve has increased the discount rate—the interest rate banks pay when they borrow money from the Federal Reserve System to be able to lend more to business and consumers. The increase in the discount rate is a good indication that the demand for credit has picked up, but it doesn't mean another period of tight credit.

A good part of the demand for credit comes from the current boom in homebuilding. New housing starts over the past few months have been running at an annual rate above the peak reached in 1950. The surge in homebuilding means that banks are being pressed for more and more mortgage credit, and they are gradually hiking their interest rates.

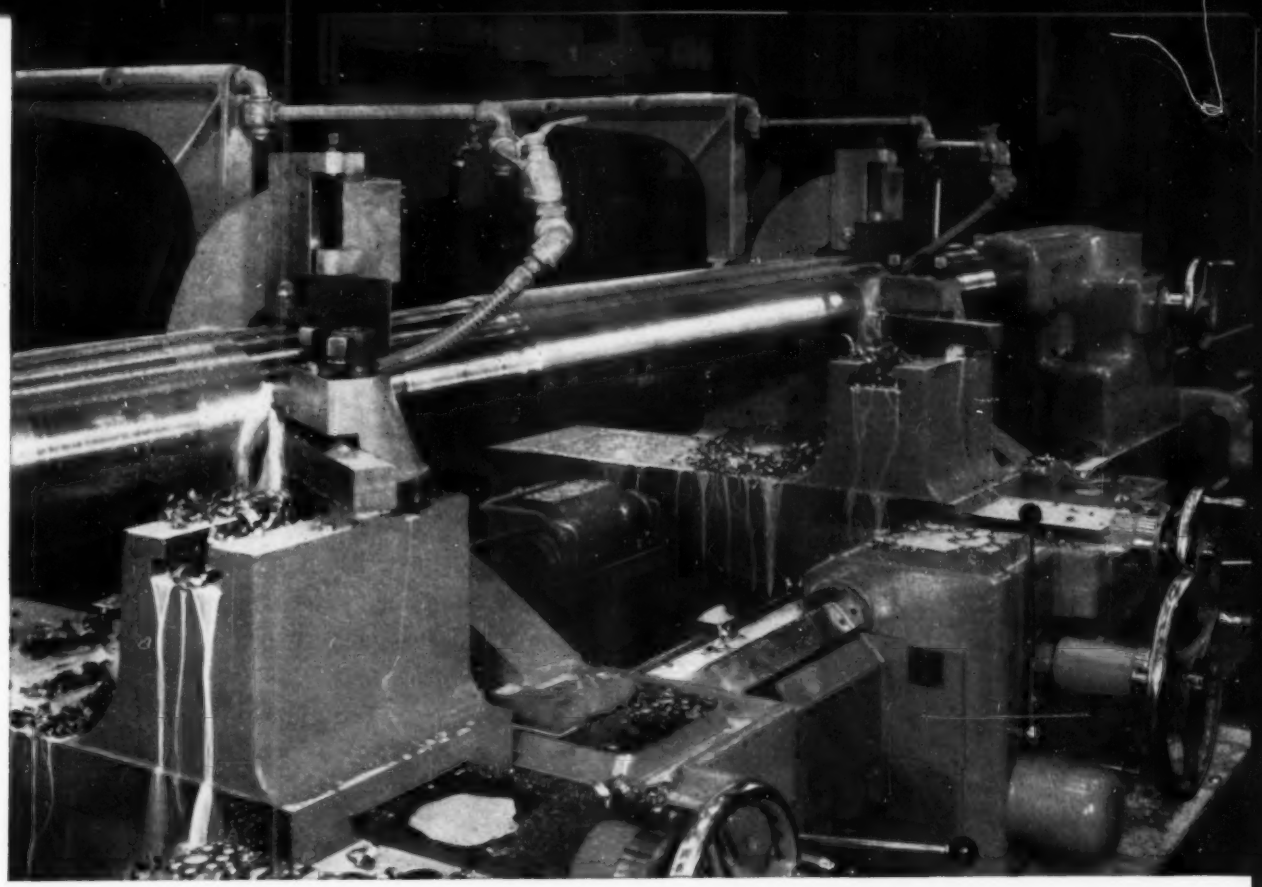
Another factor behind the growing demand for credit is the rise in consumer installment buying. The total amount of consumer installment credit outstanding jumped by more than $400 million during April of this year. That was the biggest increase for any single month since 1955, and most of it came from new car buying.

Much of the pressure being felt in the money market is caused by borrowing by the federal government. Because of the impact of last year's recession on corporate profits, the Treasury didn't collect the tax money it had counted upon to finance government spending. The government will, therefore, end the current fiscal year almost $13 billion in the red, and it has been borrowing from banks to meet expenses. But this year's business upswing will mean a healthy rise in income from taxes, so government borrowing will fall off later in the year.

Although capital spending is on the rise this year, corporations aren't borrowing as much as last year—because of rising profits and depreciation allowances. So business plans won't be upset by the growing cost of borrowing.

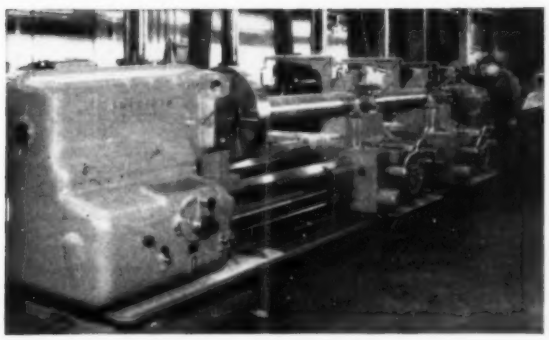
WEEKLY BUSINESS INDICATORS	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1947-49=100)*	154.8	153.8	126.6
Steel ingot production (thousand tons)	2,674	2,650	1,685
Electric power output (million Kilowatt hours)	12,761	12,931	11,155
Production of automobiles and trucks	150,819	169,551	92,254
Engineering construction awards (Eng. News-Record, millions)	$315.7	$679.6	$481.3
MONTHLY BUSINESS INDICATORS	Latest Month	Preceding Month	Year Ago
Refrigerators sales (thousands of units)	337	306	261
Vacuum cleaners sales (thousands of units)	347	271	291
Washers sales (thousands of units)	330	298	279
Household electric ranges sales (thousands of units)	102	86	71
Radio production (thousands of units)	1,348	1,125	931
Television production (thousands of units)	494	459	427
Gear sales index (1947-49=100)	234.3	199.9	171.3
Foundry equipment new orders index (shipments, 1947-49=100)	166.6	237.1	85.9

* Seasonally adjusted



● *Cutting with two Carriages equipped with plain block rests and follow rests.*

MACHINING TITANIUM BILLETS



● *32 inch "American" Double Carriage Pacemaker Lathe.*

An extremely difficult job — a real challenge to the rigidity, stamina and "staying" qualities of any lathe.

Cutting titanium offers terrific resistance to the cutting tool which in turn demands maximum rigidity of the tool supporting members in order to hold vibration to the very minimum; otherwise chatter and high tool mortality are inevitable.

The fact that all of the major titanium fabricators are using "AMERICAN" Lathes, selected only after repeated demonstrations, is conclusive testimony to the power, stamina and rigidity of these machines.

There are exclusive features which definitely contribute to this result, such as the wide, four vee bed with walls rigidly tied together between the girths by an angular web which forms a chute for quick disposal of chips; replaceable hardened tool steel vees; solid 3-vee mounting of the carriage on the bed; powerful headstock with triple bearing spindle and bearing adjustment from the outside and others which space limitations prevent mentioning.

For a complete description of all of these features just send for bulletin No. 144.

THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U.S.A.

LATHES AND RADIAL DRILLS

CIRCLE 267 READER SERVICE CARD

To Help Increase Your Profit Margin Armco Offers Useful Information on Machining Stainless

Recommended practices, based on shop-experience, are summarized by Armco machining engineers in series of booklets, motion picture, and manual.

Getting this helpful information is an important step in assuring that you make the most money on stainless jobs. The Armco booklets and manual not only outline shop-proved methods for machining stainless at least cost, but describe cures for typical problems. Supplementing this information, the Armco motion picture "Machining Stainless Steel" can be used to show your entire shop crew recommended methods for insuring top quality and high production.

Of course, the first step in boosting your profits on stainless jobs is to use Armco Free-Machining Stainless Steels. Eleven different grades enable you to select one suited for your job. Complete stocks at your Armco Distributor's Steel Service Center assure quick delivery of stainless bars in the grade and size you need.

Let us send you useful machining information and show you how you can save time and money by using Armco Free-Machining Stainless Steel bars. Just fill out and mail the coupon or call your Armco Distributor.

New steels are born at Armco

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2549 Curtis Street, Middletown, Ohio

Send me the following Armco booklets 1 2 3 4 5 6
☐ information on borrowing the film, "Machining Stainless Steel"
☐ data on Armco Stainless Steel bars

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ARMCO STEEL

Armco Division • Sheffield Division • The National Supply Company • Armco Drainage & Metal Products, Inc. • The Armco International Corporation • Union Wire Rope Corporation • Southwest Steel Products

American Machinist
MAGAZINE OF METALWORKING PRODUCTION • ESTABLISHED 1877

Inflation Is Part Of It

Inflation apparently is as inevitable as death and taxes. Despite all of the hullabaloo to try to prevent it, neither individual nor collective efforts have been successful in halting it. Some eminent authorities, in fact, go so far as to proclaim boldly that a certain amount of inflation is a good thing.

Every sensible American . . .

contemplating his own financial future, thus is compelled to consider carefully the possible effects of inflation upon his personal fortunes. At the same time, every thoughtful management must weigh the inflationary factor in evaluating its future course.

One place in which such evaluation is lacking is in calculating the replacement of capital equipment. Such calculations up to now have been based mostly on the savings to be made within the first twelve months after installation. The mathematics of the savings to be derived from the operation of the new machine over the entire period of its useful life have been pushed aside or ignored.

Yet all of us know . . .

that, year by year, hourly labor rates and fringe benefits have risen and in the years ahead will continue to go up. Other costs too are headed for higher ground.

But these simple, readily-accepted facts have not entered into the replacement formulas developed by various advocates of modernization. The new formula of the Jones & Lamson Machine Co comes then as a refreshing and constructive approach to the replacement problem. It takes into account the wage-price spiral. And the method is simple (for a detailed description of the formula, see the April 20, 1959, issue of AMERICAN MACHINIST).

Using the J&L formula, you collect and compare data on your present equipment and on the proposed equipment. Up to this point, the calculation differs little if any from existing formulas. From there on, however, a new factor enters in.

You compute the avoidable costs incurred by postponing a decision on replacement not only for one year, but also for five years and ten years. And as the years of delay accumulate, the wage and material costs each year trend upward, thanks to inflation. As the years multiply, the avoidable costs rise surprisingly fast and sometimes get breathtakingly high.

The point is that any new machine . . .

is operated for only a fraction of its useful life at the labor and maintenance rates prevailing at the time of purchase. It is not realistic, therefore, to use today's labor and material costs to figure out the avoidable costs (savings, if you prefer that word) if you replace an old machine with a new one.

Yes, the J&L projection, like any other, is bound to be somewhat arbitrary. But there is a sound basis for inflationary arithmetic in the reports of the Commerce Department's Bureau of Labor Statistics. Even if you don't go along completely with the BLS percentages, you are compelled to reckon with inflation.

The J&L replacement formula, which frankly recognizes and tries to appraise the eroding effect of inflation so far as it applies to keeping an old machine around, is worthy of widespread use. We urge you to become acquainted with it and try it out as a fair measure of whether your old machines should be retired in favor of new.

Burnham Finney EDITOR

Check...

COST-PER-PIECE

...it's usually LESS on the

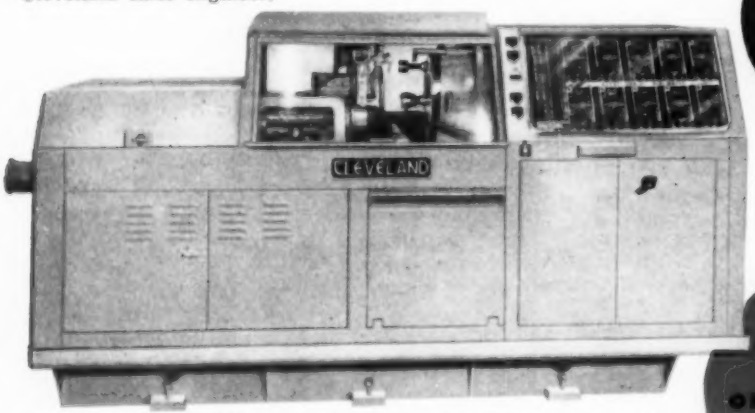
NEW 1⅜" or 1⅝" model AB

CLEVELAND DIALMATIC

Analyze each of your jobs on its own. Figure it on a new 1⅜" or 1⅝" Model AB Cleveland Dialmatic single spindle automatic, and compare the best other methods you can use. Chances are you will get a much lower unit cost on the Cleveland—even on runs as small as 50 pieces!

Dial control is the answer. With this new Cleveland you save set-up time because there are *no change gears, no special cams to install.* You simply *set the dials* to pre-select any tool feed or spindle speed that you want, forward or reverse, for each of the five turret positions . . . the *exact* feeds and speeds for all types of tools, all kinds of metals. Then set the timing dogs and you are programmed for fully automatic machining—faster, more accurate production with fewer rejects.

Apply the many cost-cutting features of the new Model AB to your jobs. Get full information—write for the new 1⅜" and 1⅝" Model AB Cleveland Bulletin, or, better still, get in touch with a Cleveland sales engineer.



ONLY the 1⅜" and 1⅝" Model AB CLEVELAND DIALMATICS provide—

EXACT SPINDLE SPEEDS—infinitely variable between 40 and 3200 rpm. Automatic changes and reversals.

EXACT TURRET FEEDS—actually **tuned** to each cut. No cam changes with Cleveland's universal camming.

OTHER PRODUCTIVITY FEATURES—independently controlled front and rear cross slides . . . independent cutoff slide . . . easy handcrank adjustment of stock feed . . . quick-change collets and feedshells . . . only 6.3 second idle motion time . . . Geneva turret indexing mechanism . . . and a host of other design features which assure long-lived accuracy—low maintenance costs.

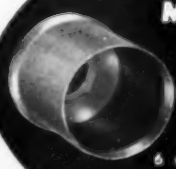
STAINLESS?

TIP ⅛" diameter, #416 stainless steel. 107 pieces per hour gross on 1⅜" Model AB. 6 operations include taper turn, end form, thread roll.

TOUGH ALLOY?

PILOT 1⅛" diameter x 4⅛" long, SAE 8620 steel. 15 pieces per hour gross on 1⅜" Model AB. 7 operations include box mill, cross turn, thread.

MILD STEEL?



HOUSING 1½" diameter, SAE 1020 steel. 15 pieces per hour gross on 1⅜" Model AB. 6 operations include heavy drill, deep form, tap.

BRASS

THREADED BUSHING ⅜" hex, free machining brass. 225 pieces per hour gross on 1⅜" Model AB. 7 operations.

or ALUMINUM?

RETAINER 1¼" diameter, 245-T4 aluminum. 65 pieces per hour on 1⅝" Model AB. 7 operations.

Remember,
CLEVELANDS CUT COSTS!

THE CLEVELAND AUTOMATIC MACHINE COMPANY

4928 Beech Street
Cincinnati 12, Ohio

SALES OFFICES: CHICAGO
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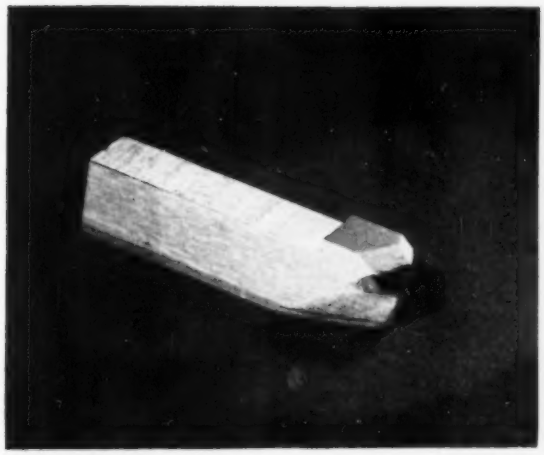
Manufacturers of a Complete Line of Single Spindle Automatic Screw Machines and High Pressure Hydraulic Die Casting Machines

Chrysler cuts aluminum with diamond tools



Diamond tool is a single stone cemented to a steel holder

Single-point diamond tools are now production-proved for aluminum die castings that go into Powerflight automatic transmissions. This hardest natural material works well as a cutting tool, resisting abrasion from the work, holding dimensions within ±0.001 in., and producing finishes to 20 microinches.

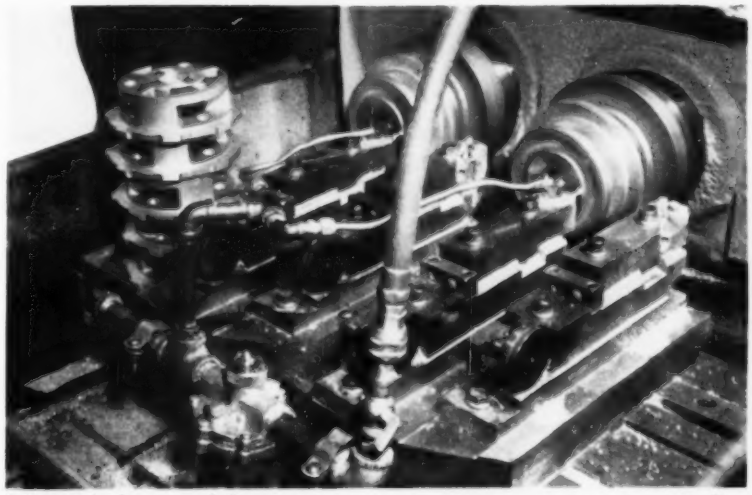
Chrysler changed its kickdown planet pinion carrier from a malleable-iron casting to an aluminum die casting to reduce weight and improve heat dissipation. But conventional tools suffered from the abrasiveness of the aluminum, and dimensions were not met satisfactorily. In particular, the high finish was necessary to act as a seat for a composition spacer, and standard tools could not produce this finish.

Diamond tools were adapted for the boring and facing job, after a considerable amount of testing and experimenting. Results were immediate—no tolerance troubles, higher production, scrap reduced, and lower costs. The sharp diamond-tool edges do not allow buildup of aluminum chips under the tool tip.

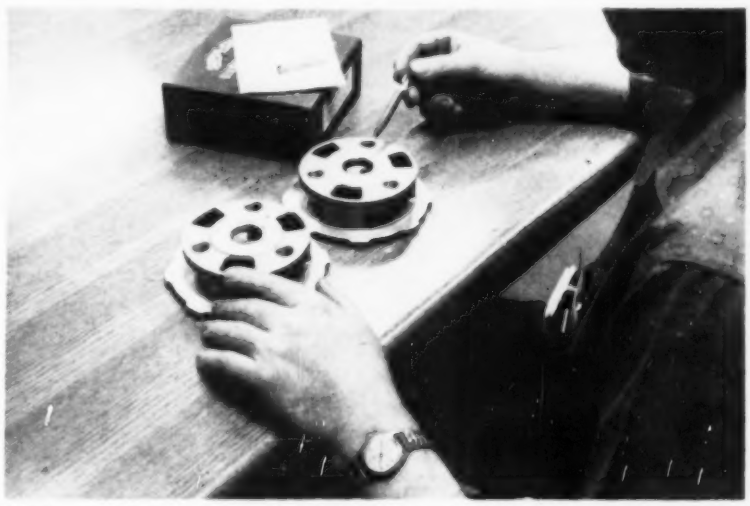
The die castings are machined on a two-station boring machine at 2500 rpm and at 722 sfpm, cutting 0.008 in. deep. Cycle time for the job is 0.38 min. No coolant is applied.

This application for diamond tools, a new one in mass production, was the subject of intensive tests and reports before it was released to the shop. It has since proved economical and practical.

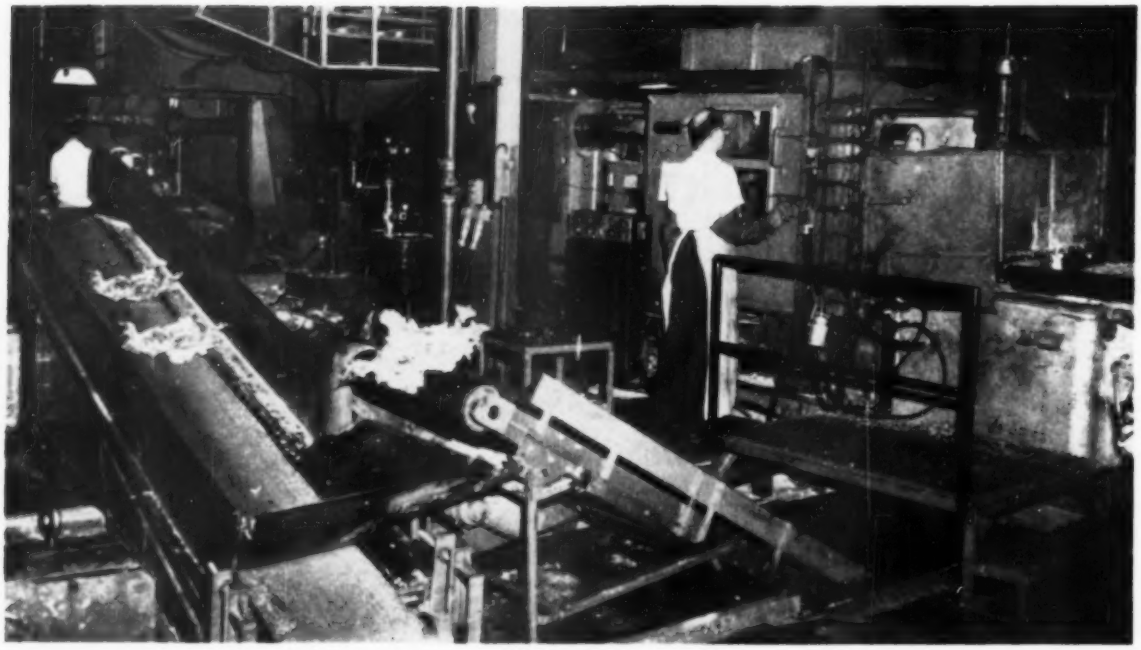
Because many more aluminum and aluminum-alloy parts are coming up in automotive production, more attention is being given to diamond tools. In mass-production setups, the sharp cutting edges that do not change dimensions are necessary for machining the soft, abrasive aluminum alloys.



Diamonds bore and face pinion carriers at production rates on a two-station New Britain Cam-nu-matic 37 at Chrysler's Indianapolis plant



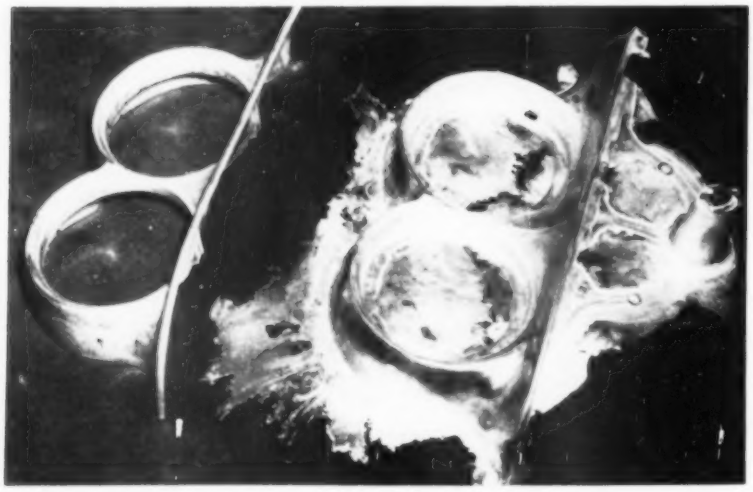
Work is a kickdown planet pinion carrier die cast in 85-100 Bhn aluminum, and machined to mirror finish by the diamond



Operator presses start button . . .
observes casting cycle through glass window. Safety switch must be actuated by casting falling into quench tank, or cycle cannot be repeated until trouble is cleared

Drop-through method

Brown-Lipe-Chapin Division of General Motors ejects gates automatically to a water quench, and conveyors take castings to the trim press. Production is 50% faster than with manual handling



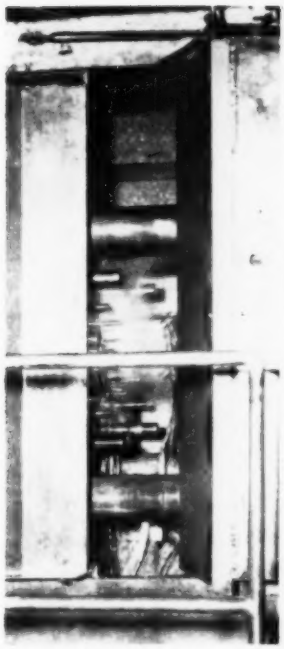
Zinc die casting . . .
for headlight door is shown after and before the trim step, where flash, runner and sprue are removed

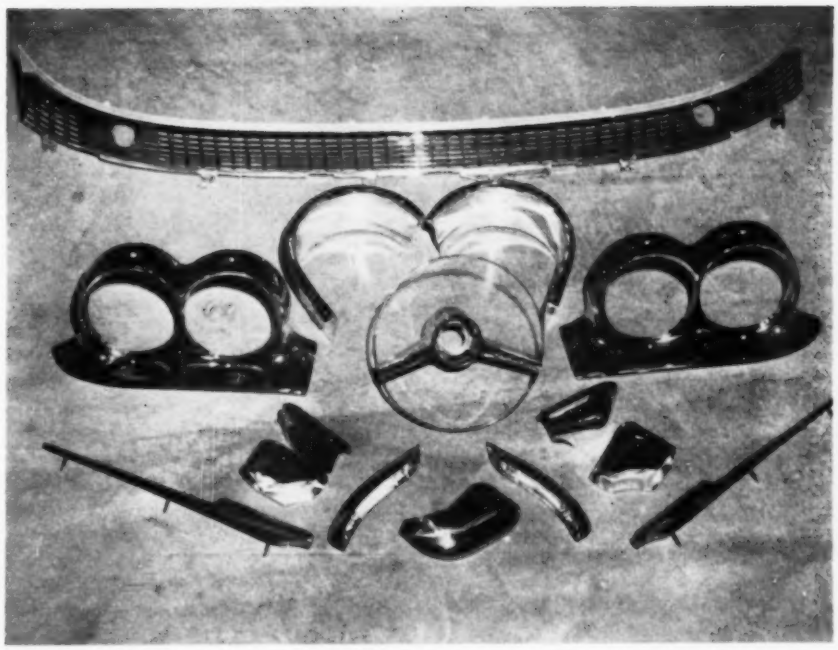
Elimination of manual handling of hot die-casting gates is a step beyond automatic ejection. In the drop-through method now partially adopted by Brown-Lipe-Chapin in its Syracuse and Elyria plants, the modifications for conventional hot-chamber machines involve:

1. Extra-long ejector pins to push the gate from the dies.
2. A water tank into which the gate falls for cooling.
3. A drag-out conveyor that delivers the cooled gate to a trim press or to a belt conveyor serving a trim press, according to plant arrangements.
4. Minor modifications in the machine controls.

Maximum operating rate is achieved. This is the reason why the over-all production rate is increased by approximately 50%. Working conditions are improved because the operator merely observes through a window and presses a button to start the operating cycle.

Casting uniformity is promoted because cycle time is constant and un-





Extra-long ejector pins (left) . . . are required to push the casting free of the die. Quality of die castings is improved by automatic quenching and handling from die-casting machine to trim press

speeds die casting

affected by operator fatigue or noticeably by other human factors. Adverse effects on the zinc die castings and the change of damage in manual handling are minimized.

Malfunctions anticipated

As the zinc casting drops from the die, it strikes a switch trip lever. Should the casting fail to trip the lever—indicating that a component has not cleared the die—the machine cannot start its next cycle until the operator resets the trip mechanism. This safety feature prevents die closure in the event of imperfect ejection, thereby avoiding possible die damage.

In the event of other functional failure, or should some die problem arise to affect casting quality, the operator simply stops the machine (or does not start the cycle), and remedies the fault. Ordinarily, the machine runs for hours at a time until the run is completed. Normally it pauses only for die lubrication, which in some instances, is provided by an automatic spray.

Outsize castings

If the casting is too large to drop between the tie-bars, or if the "draw" is too great, the full benefits of the set-up are lessened. Nevertheless, although some manual handling is required, considerable time savings are realized, because the operator can drop the part directly into the quench below the machine. This aveids the time and effort expended in lifting the gate, and turning with it to an outside quench tank or bench. In those instances where completely manual removal is desired, the altered casting machine can readily be used.

Today, most die-casting machines have the die space inclosed by a sheet-steel box whose sides incorporate sliding doors which close with the die. Usually, the operator moves the door on his side either manually or with a control device. The door must be shut before the machine will run through its cycle because of interlocks.

In the drop-through arrangement, the operator's door remains closed if it has a safety glass window. The Syracuse plant uses this design. This permits the operator to view each casting as the die opens and automatic ejection takes place. The door, which can be opened automatically or by the operator, is used only if some problem develops. At the Elyria plant, a windowless door opens automatically when the die opens, closes again before the die closes.

In both cases the operator has full view of the casting during ejection and subsequent drop. Only minor control modifications are required for both systems.

Minor investment

Adoption of the drop-through system involves some investment for the pit and below-floor quench tank, and perhaps in conveyor requirements. Brown-Lipe-Chapin has found the investment minor compared with the gains derived from increased production rates and improved quality.

AGMA's New President
John L Buehler
President
Indiana Gear Works, Inc

VP, Technical Div
Folke Richardz
Consulting Specialist
Westinghouse Elec Corp

VP, Gear Products Div
J F Murray
President
Winsmith, Inc

Connell Award Winner
Granger Davenport
Chief Engineer
Gould & Eberhardt, Inc

AGMA gets tax, research, and standards ideas

"The best month since May, 1957"—that's how retiring president E F Borisch summed up the April reports of members of the American Gear Manufacturers Assn as he opened the 43rd annual meeting at Hot Springs, Va, early this month. The cheerful note thus set dominated the meeting.

Some special techniques for utilizing the special $10,000 depreciation deduction were outlined by A E Oehmann of the law firm of Lamb & Long. While these techniques should not be undertaken without competent legal counsel, this is the general method:

If a corporation needs five machines costing $10,000 each, the company can buy one and write it off under the special exemption. Four minority stockholders can then each buy one machine, write it off on the special deduction on their personal tax returns and rent it to the corporation.

Then the company can buy the machines, one a year, from the stockholders and take a special depreciation writeoff on each as purchased. A partnership firm can follow the same general procedure, by arranging with friends who are not partners to purchase the machines.

In aircraft and missile manufacture there is an acute shortage of facilities at the same time there is an excess of facilities, said S B Daniels of the Aerospace Industries Association. This is because many existing plants are not adaptable to the new requirements.

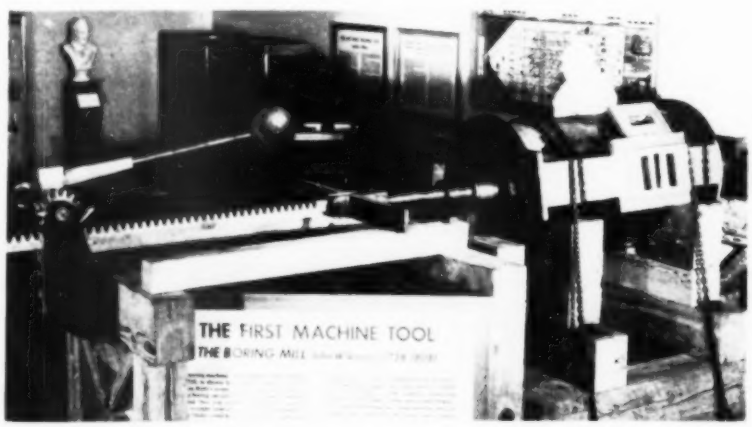
Large-scale production of weapons systems will become a thing of the past, Mr Daniels predicted.

The gear industry should get together on joint programs of manufacturing development, urged Mr Daniels. Such programs are needed in both cutting and inspection of gears and stand a better chance of Air Force support when they have the backing of an industry association, he said.

A drawback of the AGMA standard on fine-pitch worm gearing is that the worm and gear cannot be designed for a pre-determined center distance, said E D Knab of Bell Telephone Laboratories. Bell Labs has developed a supplementary procedure using a worm and helical gear combination.

With this method, the worm and gear may be manufactured and inspected independently and critical axial alignment is not essential. The limited tooth contact, however, limits it to light loads and relatively low speeds.

The Edward P Connell award for outstanding personal contributions to the art of gearing was presented to Granger Davenport, chief engineer, Gould & Eberhardt. In addition to the new president and the vice presidents (see above), Charles F Bannon, vice president, Western Gear Corp, was elected treasurer. Three new members elected to the board are Robert O Bass, president, Morse Chain Co; E R Fellows II, vice president and general manager, Fellows Gear Shaper Co; and F D Weatherholt, manager Gearing Div, Westinghouse Electric Corp.



DoAll Dedicates Hall of Progress

Full-scale reproduction of John Wilkinson's boring mill, the first machine tool, built in 1775, is one of the displays in DoAll Company's "The Dawn of This Age" exhibit. The boring mill produced cylinder bores for James Watt's steam engine, and ushered in the industrial age. Hall was dedicated and Leighton A Wilkie, chairman of DoAll's board, was honored at a dinner, June 11, sponsored by Newcomen Society of North America

Richness rolled in . . .

Patterned sheets bring finer finishes faster

It takes very close inspection to discover that the beautiful calf-skin-leather instrument panel on one of the 1959 cars is actually painted steel. Similarly, the library-leather look of Westinghouse Electric Corp's new "furniture-styled" L-1000 Laundromat and D-1000 automatic electric dryer is difficult to recognize as baked enamel. It is even harder to conceive that either of these textures came from the rolls of a steel mill.

Nevertheless, the material for both the appliances and the automobiles entered each plant as pattern-rolled steel sheet. Pittsburgh Steel Co is producing the material, patterned to suit the customer, in plain steel up to 48 in. wide in either coils or cut lengths and of commercial or drawing quality.

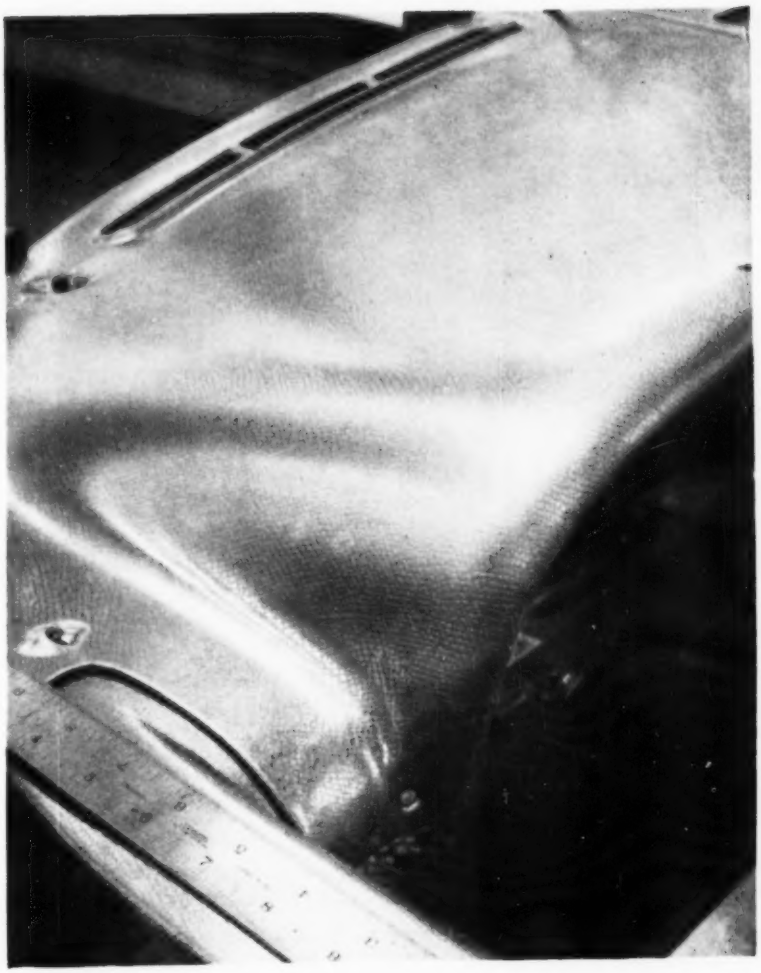
The auto maker uses calf-skin grain of his own design. He buys five widths, ranging from 16 in. to 23½ in., in coils. Because of the cost of the special rolls, it is necessary that special textures be supplied in fairly large quantities but some standard textures are available.

While patterned sheet can be used functionally to improve adhesion between steel and materials being applied to it, such as ceramics, the biggest use for wide patterned sheet is as a decoratively finished steel. For this purpose, pattern-rolled sheet is used plain or with a painted, lacquered, or enameled finish.

Because the instrument panel receives the closest driver scrutiny, its manufacturer insisted on excellent surface quality. The severest test was a 4½-in.-deep draw at one corner. It was, and is, accomplished with no distortion in the pattern and no tears or rips. Close control of pattern depth from roll to roll avoids trouble during the forming operation.

Use of the patterned stock simplifies the problem of spotwelding and other joining operations as compared with vinyl-coated steel because no special equipment is necessary.

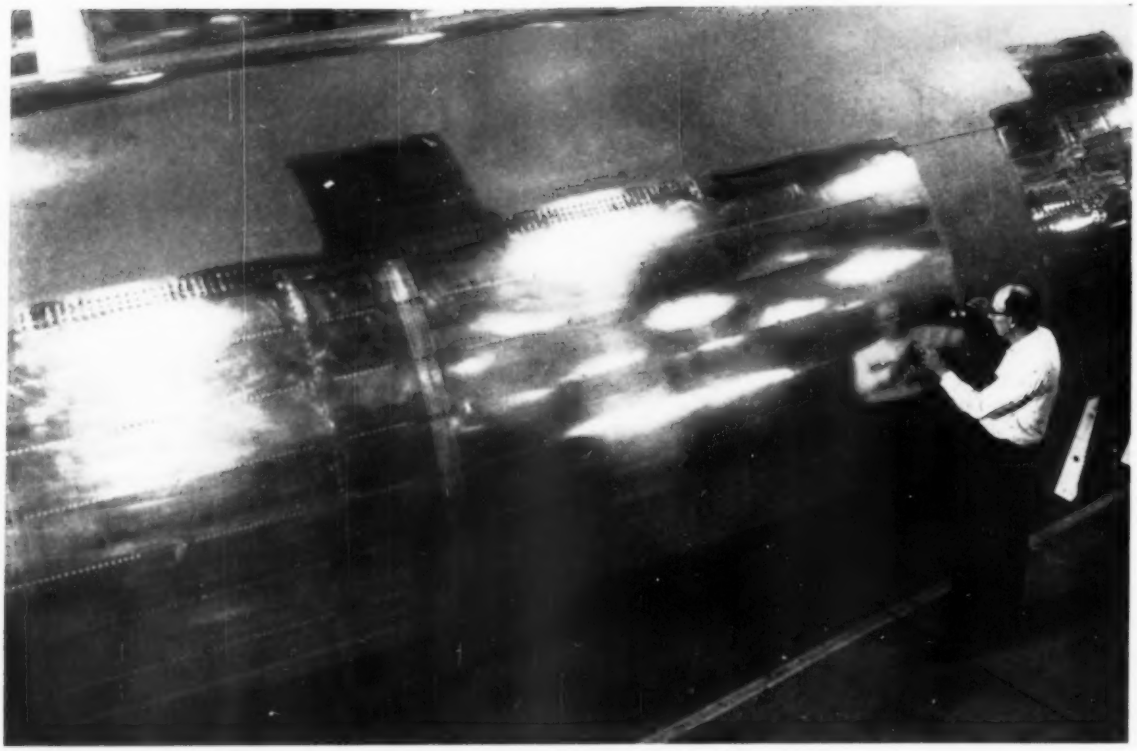
Westinghouse, in making washing machines and dryers, gives the patterned sheets 27 piercings and notchings in addition to a four-side flange. After bonderizing, the shell receives a sprayed-on enamel coat which is baked. Even on corners and bends, the pattern emerges from forming operations unmarred.



Calf-skin grain . . . is rolled directly into sheet steel for instrument panel of 1959 auto. Material can be blanked, drawn and punched or otherwise worked to fairly severe limits without distorting most patterns. Final texture can be applied by painting, lacquering, enameling, electroplating or other finishing techniques. Price is considerably below that of plastic-laminated steel sheet

In this process, any design you can draw is etched on a steel roll. Then plain, cold-rolled, annealed steel sheet is passed between the patterned roll and a back-up roll under pressure. The pattern etched on the roll is transferred into the sheet, continuously. Pattern depth is available from 0.0025 to 0.005 in. Gages are running between 22 and 16.

Pattern-rolled *strip* is not a new product with Pittsburgh. Its Thomas Strip Div at Warren, Ohio, has been producing it, in widths up to 22 in., for years. Thomas Strip offers patters rolled in plain steel or in steel coated with a variety of other metals and materials, such as copper, brass, zinc, paint, lacquer, enamel and plastic. Now, the availability of 48-in.-wide sheet opens a practical source for major components.



About 77,000 spotwelds join KC-135 skins . . .
to skins, doublers, stringers, and bulkhead components. Surface cleanliness is critical, so welding must be done within 24 hr after etch cleaning

Automatic spotwelding replaces riveting . . .

. . . in building huge aluminum fuselage sections for Boeing's KC-135 tanker transport. Tape control of welding positioners, and the use of television are among new techniques developed to solve the problems this job created

By George H DeGroat, associate editor

For the first time in the aircraft industry, automatic spotwelding of long, double-contoured aircraft panels is a production operation. The huge aluminum skins are for aft fuselage sections of the Boeing KC-135 Air Force jet tanker-transport. Ryan Aeronautical Co, San Diego, Calif, is the sole supplier of these major sections, the largest ever subcontracted in the aircraft industry.

Early in the KC-135 program Boeing specified spotwelding for the skin assemblies in preference to riveting. **The goal was to save production time, but even more important, to achieve a cleaner, smoother surface with less drag and weight.**

At the time, the plan was to spotweld only the comparatively easy-to-handle single-contour skins. But later it was decided to develop a technique for welding the double-contour skin assemblies, too. This was an infinitely more complex problem, because the skin must be perpendicular to the welding tips for each spotweld.

Ryan first built an experimental setup to carry the sections through the welding machines. It used four jackscrews attached to the welding frame that carried the skins.

The jackscrews levelled the frame and held it in place, but it was moved manually from one spotweld position to the next. This slow, tedious process was discarded in favor of a new kind of positioner developed jointly by Ryan and General Riveters, Inc, of Buffalo, NY.

Electronic positioner

The new positioning tables are the first in the aircraft industry to be electronically operated. And the spotwelders they serve—five Federal machines and one Sciaky machine—are larger than any others designed for certified structural welding.

Each of the welders has a throat of 73 x 54 in. and is equipped with a 3-phase, unipolar, 250-kva transformer which can supply up to 130,000 peak amps of welding current. With this equipment, crack-free welds can be made in two thicknesses of 0.091-in. aluminum sheet with a unipolar schedule.

Each of the new positioners employs an electronic system of "sen-

sor-leveling" while guiding the huge panels through the welding machine. A sensor head, mounted on the electrode, controls level positioning of the skin as it comes into contact with the electrode.

Four Teflon contact knobs (or fingers) on the sensor head control the lengthwise and crosswise tilt of the table. Two of them handle lengthwise tilt by raising or lowering the ends, one of them controlling a r-h elevator on the table carriage and the other a l-h elevator. Both elevators have screwjacks for lift and descent.

The other two sensor controls provide rolling motion through a tilting mechanism which consists of two hydraulic cylinders mounted on trunnions. These rotate the trunnion and the welding frame in which the skin is carried.

In addition, the table carriage has its own elevator which raises and lowers a trunnion mechanism. This is driven in and out of the welder throat by a transverse drive consisting of a horizontal screwjack mounted on the elevator carriage.

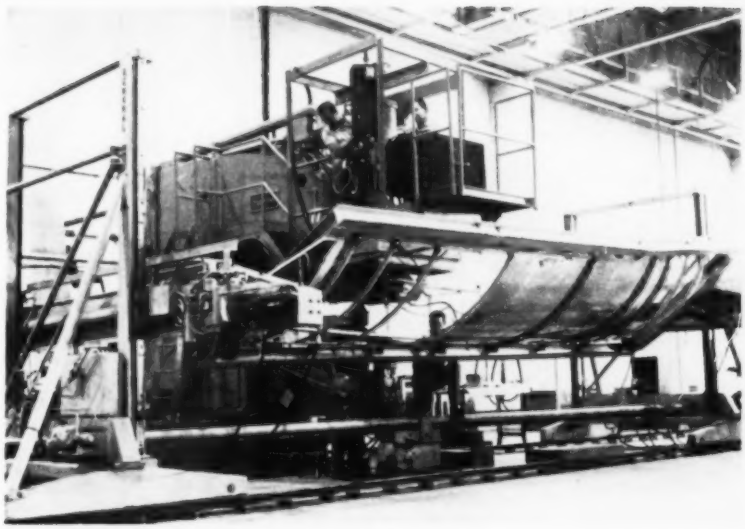
To keep the skin from rubbing against the lower electrode during horizontal movement, the table-carriage elevator, under electronic control of the sensor unit, automatically raises it ⅛ in. Upon command to weld, the skin is automatically lowered into contact with the lower electrode.

The two end carriages are connected by the longitudinal drive rack that positions the spotwelds longitudinally. Transverse positioning is controlled by a transverse drive mechanism.

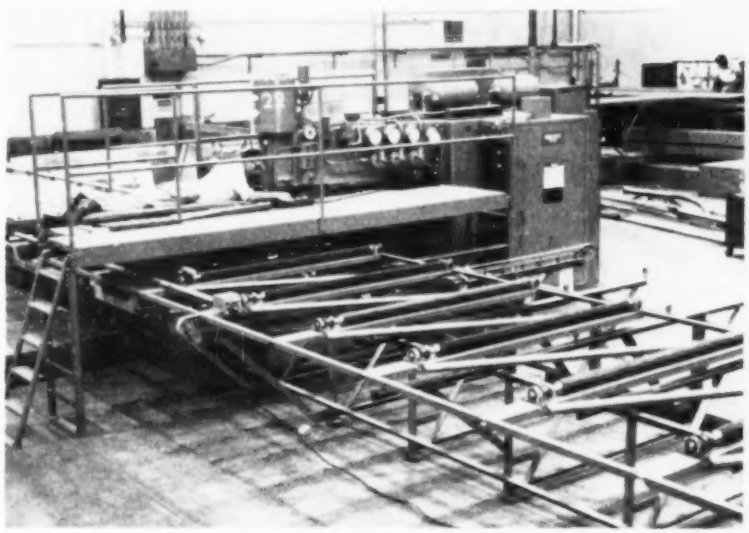
Tape Controls spot location

Manual control of the cariage provides for locating the first spotweld, for loading and unloading, and for any other operation requiring the operator. **During the welding operation, the carriage is normally controlled by a punched-tape command unit which provides complete positioning, longitudinal and transverse, with an automatic interlock between the positioner and the welder.** Commands are relayed by a selsyn motor.

An alternate carriage-control system—an increment spacer—is provided for welding equally spaced, repetitive spots on such components as stiffeners and doublers. To follow the edges of doublers, splice plates, and stringers, a tracing head is mounted adjacent to the upper electrode of the welder. This profiles against the edge of doublers and stiffeners to provide uniform edge-distance spacing.



Positioner automatically locates panel . . .
for each spotweld and levels it at the welding tip; handles complex double-contoured panels with various weld patterns and sheet thicknesses



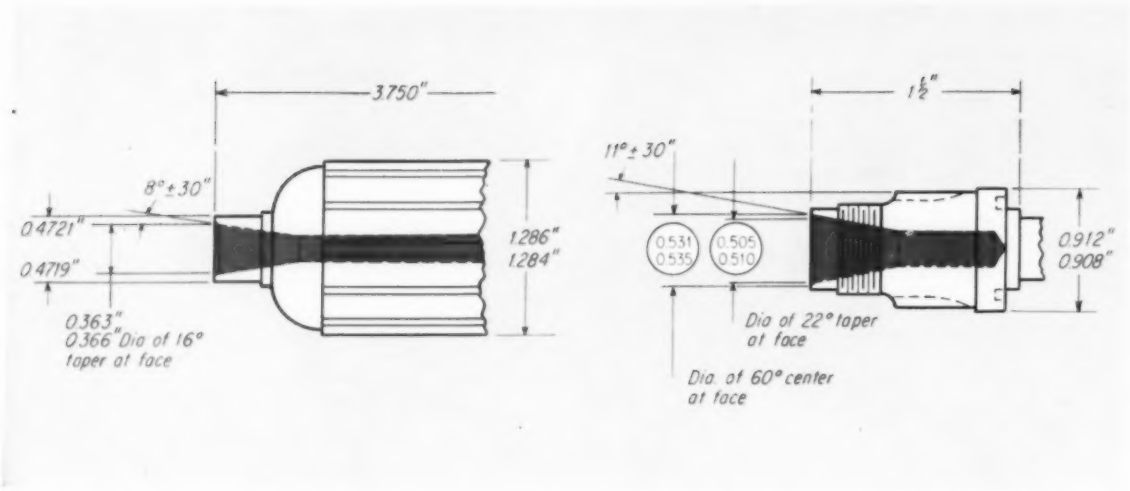
Single-contoured skins are welded here . . .
Positioning table, 27 ft long x 6 ft wide, automatically indexes aft fuselage skins with a series of cams and limit switches

Single-contour welding

For spotwelding the simpler, single-contoured skins, three other General Riveter panel tables have been installed—two with 70-in.-throat Sciaky welders, the other with a Federal machine having a 60-in.-deep throat. These tables index longitudinally and transversely with a combination of conventional electrical and hydraulic controls.

Each table employs a counting system whereby the count is a predetermined number of 1/10-in. increments—the space between spotwelds being multiples of these increments. A series of cams and limit switches controls the spot spacing. When a predetermined limit switch is energized, the movement is stopped, and the welder automatically fired.

On two of the machines, a television camera under the table transmits an image to a receiver in front of the operator so he can check spotweld quality as the work progresses.



The tapered bores on armature shaft (left) and spindle extension (right) must be precision finished

Carbide mill bores small tapers at 45,000 rpm

By Stedman J Kosterman, plant superintendent, Precise Products Corporation, Racine, Wis

The Problem: Finish machine the small tapered sockets in the ends of hardened steel parts (48-52 R_c). The taper is either 16° or 22°, ± 30 seconds, with a large diameter of only about half an inch. And it must be concentric with the supporting bearing surfaces, because the part will rotate at speeds of 25,000 to 54,000 rpm when finished and assembled in the final product.

The Solution: A high-speed boring and grinding machine with a ¼-hp power quill serving as the tool spindle. We designed the unit ourselves and equipped it with one of our own Super-50 high-speed quills. The workpiece is rotated at 220 rpm by a 1/10-hp, Howard geared motor.

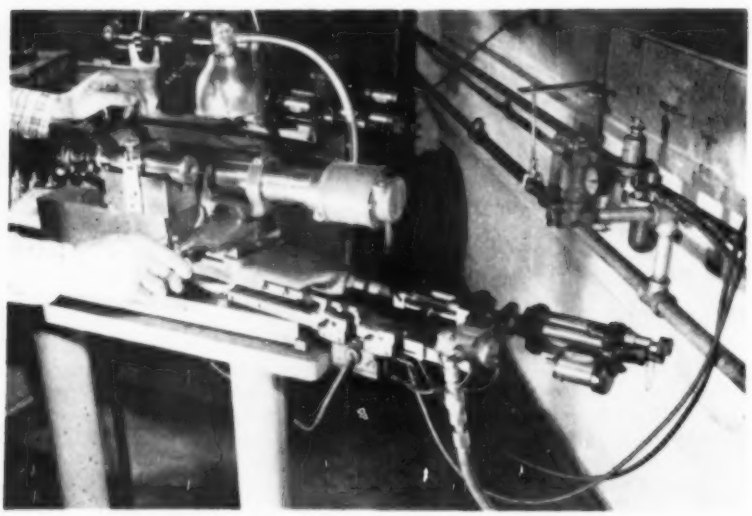
With a spindle speed of 45,000 rpm and a tool feed of 6 ipm, we are taking cuts up to 0.003 in. deep with carbide radius mills and up to 0.0002 in. deep with a mounted abrasive wheel. The milling cutter gives us finishes of 8 to 12 mu in., and the grinding wheel, 6 to 8 mu in.

The compact machine fits on a 9 x 26 x 1-in. steel table top, with the tool spindle on the right and the work support assembly on the left. The tool spindle is mounted horizontally on a cross-and-compound-slide assembly from a 10-in. South Bend lathe.

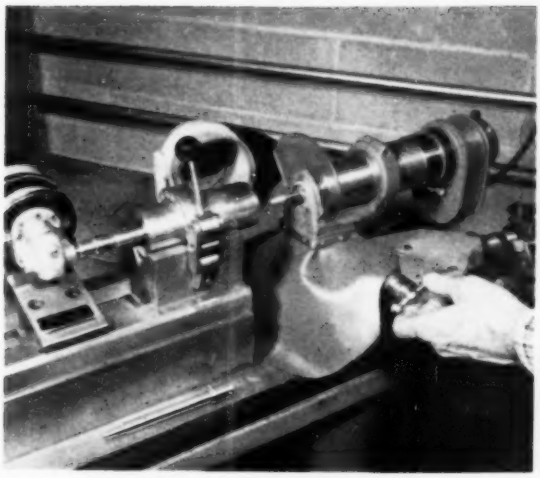
The cross-slide member of this assembly is scraped and carefully fitted to a hardened and ground sub-base. The sub-base in turn is fitted to the machine table so it can be positioned angularly with respect to the axis of the work.

Also mounted on the sub-base and connected to the cross-slide member is a Bellows air-hydraulic feed cylinder assembly for traversing the cutter into and out of the workpiece. Lateral adjustment for depth of cut is made by the compound slide, set at a right angle to the cross-slide.

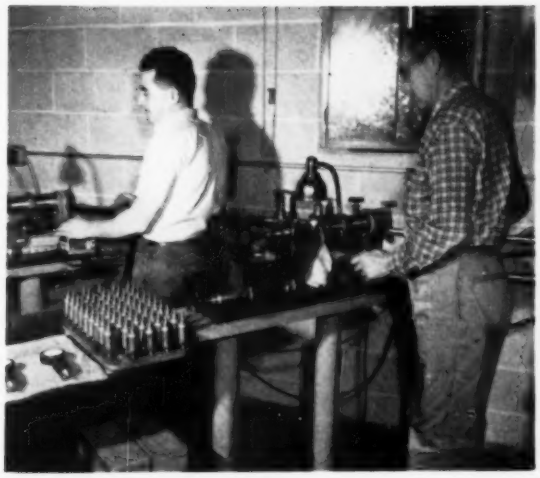
At the left side of the table, the workpiece is mounted between a pair of precision ball bearings in cylin-



Air-hydraulic cylinder feeds cutter . . .
into work on automatic cycle. Cross-and-compound-slide assembly supports 45,000-rpm tool spindle for final operation on armature



Geared motor drives workpiece . . .
which is mounted in precision ball bearings. This machine normally grinds 16° tapered bore in spindle extensions



Machines both grind and bore . . .
with 45,000-rpm Precise power quills serving as tool spindles, but normally, one machine is set up for each operation

drical quills, which in turn are clamped in a V-block. Both the V-block and the work-drive head are mounted on a hardened and ground rising block which accurately aligns the axis of the workpiece with that of the tool spindle.

Two of these special machines handle our normal requirements for the parts with tapered sockets: armature shafts and spindle extensions for our grinder-millers and power quills.

Normally, one machine is set up for each part. One of them grinds the tapered bore in the spindle extension to a 22° included angle. The other "micro-mills" the motor-armature shaft to a 16° included angle with a solid carbide cutter.

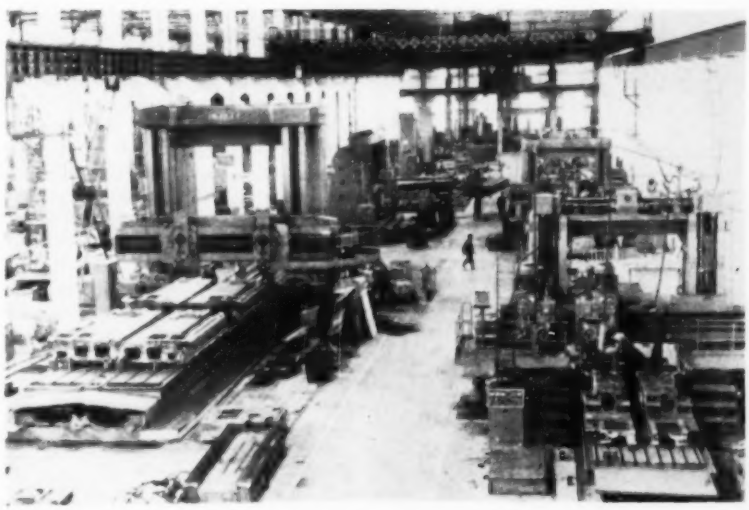
Since it usually takes only one in-and-out pass to finish each taper bore, and as the operator can load one workpiece in a quill while another is in the machine for an automatic cycle, production is rapid. We usually average 25 spindle extensions per hour in the grinding setup and 35 armatures per hour in the "micro-milling" setup.

Red China boosts heavy machine tool production

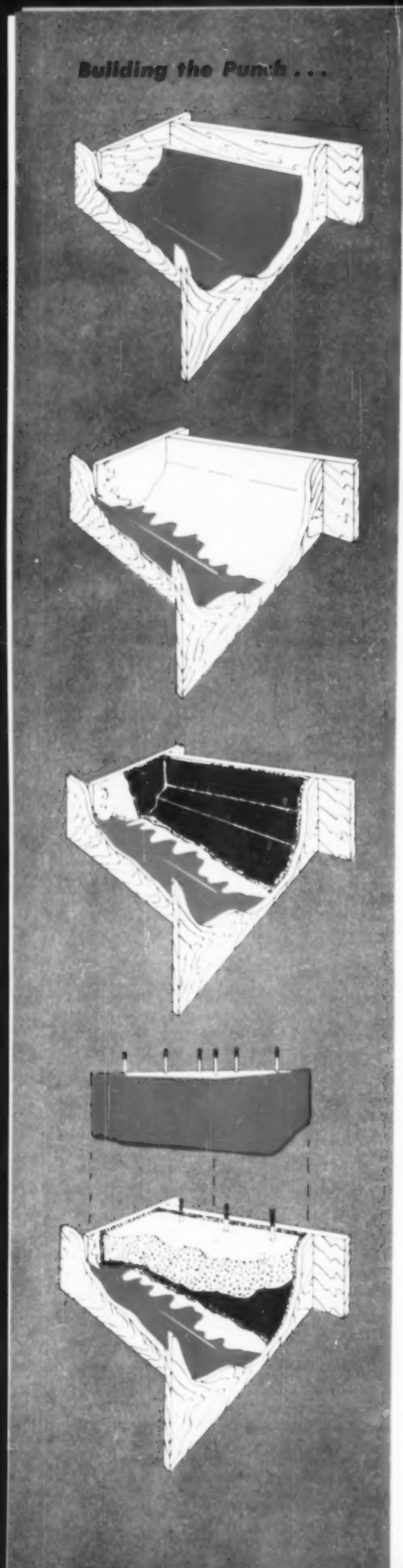
Red China's Wuhan machine tool plant (right) will build 380 machines a year by 1960, the average weighing 100 tons, Robert W Asquith, chairman of Asquith Machine Tool Corp Ltd, reports. Mr Asquith recently visited a number of Chinese plants (*AM*—May 4 '59, p 77). This plant makes planers, large VBM's, and plans to build plano-millers, heavy lathes and hobbing machines.

Peking No. 1 machine tool plant is turning out millers of Russian design that resemble Cincinnati and Kearney & Trecker machines. Employment amounts to 6000 on two shifts. At a Shanghai grinding machine plant, about 15% of the 4300 workers are women.

Mr Asquith's impression is that the Chinese make a wider range of machine tools than Britain. At one plant, "building block" machines were in use. Interchangeable units can be combined to form seven different types of machines.



Wuhan Machine Tool Works employs 8000 people, with 2000 trainees. Its facilities are better than in any British plant, in Mr. Asquith's opinion, and can be compared with Schiess in Germany. Foundry is claimed to have capacity of 250 tons of castings a day



All-epoxy die for drop hammer . . . forms components for a jet-engine tailpipe. All-epoxy construction cuts die weight by 50%, eliminates machining and coping

All-epoxy dies for short runs

By William O Rau, pattern shop foreman,
Rohr Aircraft Corp, Chula Vista, Calif

Savings upwards of $90 per cu ft in manufacturing costs plus considerable savings in time and labor resulted when Rohr Aircraft switched over from standard epoxy-faced metal dies to all-epoxy dies at its drop-hammer plant at Chula Vista, Calif. Though designed for short-run forming of aluminum, annealed stainless and lower-carbon steels, these dies are capable of sizable runs. One die has produced over 1000 aluminum parts without being reworked.

For the past year Rohr has had outstanding success with these all-epoxy-resin dies. Over 80 different dies have been used to form contoured and beaded skins, contoured and angled Z's and shallow pans for the aircraft industry. Because of their strength, durability and dimensional stability, the dies can be used on a wide variety of materials including 2024-O, 7075-O and 6061-W aluminum; Types 302, 321 and 347 annealed stainless; and 1010 and 1025 steel.

Why the switch? Economy. Look at these savings on drop-hammer and other impact dies:

- Upwards of $90 per cu ft in manufacturing costs;
- Time and labor savings through elimination of bluing, grinding and machining. An epoxy die 6 ft long by 3½ ft wide by 12 in. deep can be made in 32 man hours—less time than usually required just to cope a cast metal die;
- Die redesign takes a minimum of time and effort; and,
- Dies can be repaired and returned to service in a few hours.

All-epoxy dies are ideally suited to prototype and short-run forming on most types of presses—double-action, punch, drop-hammer and stretch presses. The number of impressions obtainable, of course, depends upon the amount of draw, the draw radius, the material, and the complexity of the part.

When our old epoxy-faced metal dies became obsolete, the epoxy was stripped off, not without difficulty,

and the cast metal repotted. Over the years, however, there was a gradual degradation of the metal, plus about 7% volume loss on each recast. Cost of reclaiming die metal ran to approximately eight cents per pound. To avoid a major expenditure for new die metal, we looked into new ways of making our forming tools, and finally decided on this all-epoxy construction.

The fabrication steps pictured here are for a drop-hammer die, but are essentially the same for any all-epoxy die. Three different epoxy-resin/hardener formulations are required for the gel coat (Epocast 7D), lamination (Epocast 2G), and mass casting (Epocast 11D). Furane plastics, Inc, Los Angeles, employs Epon 828 resin (Shell Chemical Corp) in all three of these room-temperature-curing tooling compounds.

Building the punch

The punch is made first. After setting up a net pattern and diking the sides to the necessary depth, apply a parting agent to all the inner surfaces. Next, brush on the epoxy gel coat. This gels in about 30 minutes.

A minimum ½-in. lamination is then built up over the gel coat, alternating layers of 0.015-in.-thick, square-weave glass cloth with coats of laminating epoxy resin. When the laminate has cured, fill the punch cavity with mass-casting resin. This formulation consists of 20 lb of Epocast 11D mixed with 5 lb of hardener. To this is added 23 lb of ground walnut hulls as filler.

The punch cavity is filled to within one inch of the top of the dike board, leaving one inch of the lamination above the casting resin. Into this area, molten lead will be poured when the die is placed in the hammer.

The die is made over the inverted punch, which is supported on I-beams to clear the tie-in bolts. The punch itself is waxed to allow for metal clearance. After diking the sides of the die, the same construction sequence is followed—parting agent, gel coat, lamination and mass casting.

Both faces of the dies illustrated are hard surfaced. This is somewhat unique. Ordinarily, to form any sheet metal, a hard surfacing material is used for the die and a resilient material for the punch. (Utilizing a resilient material for the punch eliminates the need for machining or coping.) However, in this case, providing metal clearance is not a critical factor since there is sufficient yield in the all-plastic die and punch to make up for slight discrepancies.

Just before filling the die cavity with mass-casting resin, weld the steel hold-down bolts to the steel reinforcing rod. This minimizes the possibility of cracking the die. When the die cavity has been filled, the resin mixture is screeded off to the edges of the dike board. With this area perfectly flat, machining of the die becomes unnecessary.

Positioning

Normally, cast or solid-metal dies must be machined to assure that the punch and die will be parallel in the press. Otherwise the die will not form the sheet stock properly because of mismatch between the faces. After being machined, the die is then coped—the tedious and time-consuming job of bluing or scraping in of the die.

With an all-epoxy die, however, no machining or coping is necessary. The punch is set on the die and the assembly is placed in the press. Molten lead is then poured into the cavity above the mass-casting resin of the punch. Immediately lower the upper platen of the press onto the lead. When the metal cools it will be level and parallel to the base of the die.

Die redesign and repair

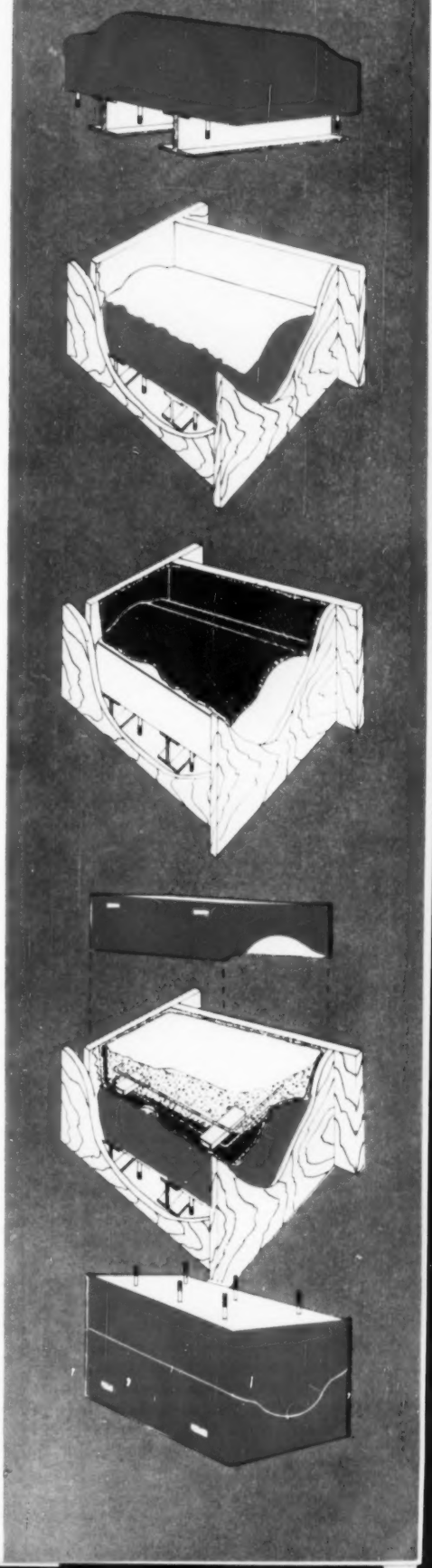
Engineering redesigns or contour changes are easily handled in any one of a number of ways. First, the epoxy face can be stripped down to the laminate; second, the glass-fiber lamination can be replaced; or third, the new design can be achieved by refacing the die with mass-casting resin.

The fractured face of an epoxy die can be repaired and the die returned to service in a few hours. Fill the cracked area with clay and take a plaster cast of the area. Next, remove the splash and strip out the clay. Grind grooves in the epoxy to provide for a recasting area. Finally, place the plaster splash in position on the die and apply mass-casting resin to the damaged section.

Versatility

Because it is versatile and easy to build, the all-epoxy die should find wide application in automotive body plants and in job shops using small presses and punchpresses. So promising are the results to date, that Rohr is investigating the development of epoxy dies suitable for elevated-temperature forming.

Building the Die . . .



Manufacturing curve is flattened in spite of demand rise and fall, by constant study and part-quantity tabulation

Flexible scheduling flattens

Plan ahead—the only way to beat feast-or-famine orders for a seasonal product like power lawn mowers. Moto-Mower does it by scheduling — and rescheduling — with a system similar to those applied by the automotive and appliance industries; and by diversifying their products.

The first day of spring always sends mower sales booming, but orders drop back out of sight by the middle of summer. Spring actually starts at a different time each year, and at a different time in each part of the country. The plant might simply build up a huge stockpile of machines, but warehouse and inventory costs would be prohibitive. On the other hand, trying to keep just a bit ahead of orders means rush production, poor quality, high maintenance and operating costs, layoffs in slack months, and low morale.

The best answer is flexible scheduling combined with diversification. Moto-Mower has one quality line of mowers under its own name, plus two other lines that sell to mail-order houses and department stores. This factor helps spread the load because the two secondary lines peak their orders at different times. Even so, scheduling is difficult and complex because, between different colors, six wheel sizes, six engines, decks made of stamped steel, die castings, and fabricated tubular construction, and cut widths from 18 to 24 in., there are 73 mower models.

Five-stage plans

Production planning has five stages. **First, an annual meeting** of top management establishes broad budgeting, pricing, and overall production planning. Probable sales requirements are determined, and production target dates are set.

Semi-annual meetings get more specific by bringing together department heads, production control, and purchasing personnel along with top management to revise plans.

Quarterly meetings decide on purchases of mower engines (which require a three-month lead time), special steel, and other materials that require extra time for delivery.

Monthly schedules authorize shipments of components and raw materials from outside suppliers, and they cover manufacturing volumes for casting, stamping, and machining departments. Actual quantities of each mower style are determined from actual and anticipated demands. Punched cards are made up for all components in each mower to be produced, which makes it easy to count off total numbers of each component once the monthly mower quota is set. An IBM 605 data processing machine determines quantities.

Finally, weekly line schedules establish handling and control for major parts required by each of six production and assembly lines; two for each of the three basic mower models produced.

Simple paperwork

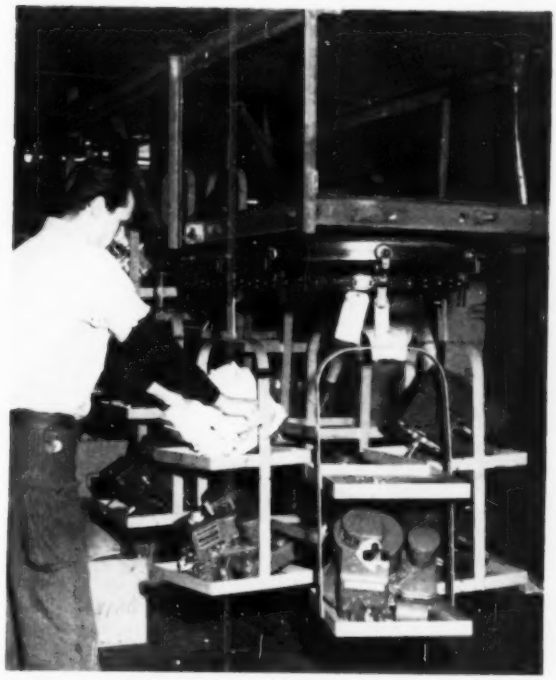
Only three forms are distributed to plant personnel to cover weekly, monthly, and quarterly schedules; and two additional forms cover semi-annual and annual plans.

As in the automotive industry, a complete model change is made each year. Recent trends toward riding mowers, self-propelled units, and trimmers complicate manufacturing problems much more than old-style wheel-and-reel assemblies. Therefore, the annual changeover is made in July, when the plant is closed for vacation. Production of the new models begins in August, and it rises in a gradual curve to a plateau that holds through June. Half of the annual production total is completed by January.

Three basic mowers are assembled on six lines that produce 73 different models altogether. Engines, tires, and colors all vary

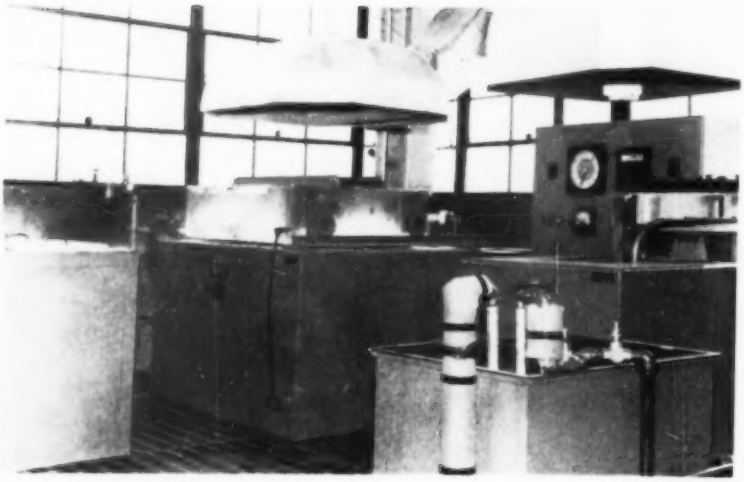
mower production peaks

By D E Alexander, production manager, Moto-Mower, Inc, Richmond, Ind

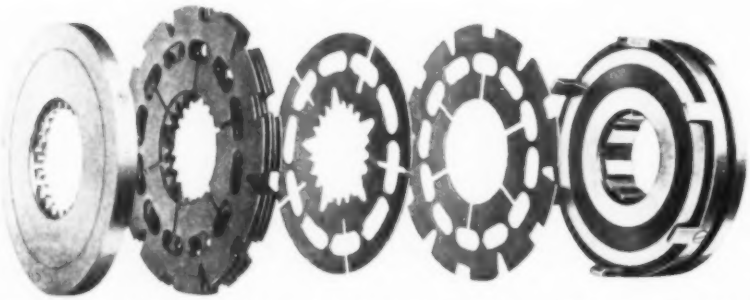


Engine control point spaces engine types, sizes, and colors on conveyor carriers. Every fourth carrier, for example, gets a red 2-hp engine that is delivered to line No. 1

Deck control point spaces steel and die-cast decks in sizes from 18 to 24 in. Conveyor is geared to deliver more than required to insure an adequate supply of parts



Salt-bath heat-treating department takes up a minimum of space, fits right into the production area. Installation consists of an isothermal quench furnace (left), an austenitizing furnace (center), and a carburizing furnace (right). Tank in foreground is a brine quench tank



Heat-treated clutch parts include the laminations, slip ring, and drive lugs. The drive lugs and the splined shaft (not shown) are also carburized. Original installation handled only the laminations

Captive salt-bath hardening pays its way

Salt-bath furnaces were first installed for occasional operation in ultra-critical hardening of a magnetic clutch part, but are now kept busy on an ever-increasing variety and volume of work. The original decision in favor of in-plant heat treating, though not easy to justify at the time, has proved a wise and economical choice.

Just when is in-plant heat treating justified? Many factors must be considered—work volume, space requirements, equipment costs, maintenance, labor costs. More often than not, it is simpler to send the work out to a commercial heat treater. Often, however, some aspect of the job requires such close control that the job cannot be sent out for heat treatment.

The I-T-E Circuit Breaker Co, Philadelphia, ran into just such a problem in the hardening of laminations for its new line of magnetic clutches. Blanked out of SAE 1070 steel strip, the laminations were carefully deburred and then heat treated for maximum hardness. Meanwhile, it was essential to preserve their magnetic qualities and retain the ductility that permitted them to transmit the load.

A salt-bath furnace, with its uniform, scale-free hardening, seemed an ideal solution—except for one thing. The laminations required only a fraction of the furnace capacity. Should such an installation be put off until work volume is sufficient to assure continuous operation? I-T-E said no, and installed one salt-bath furnace for heating and another for quenching.

The choice proved, and still is proving, a wise one. The work comes out of the furnace clean, scale-free, and with negligible distortion. Hardness is closely controlled and is easily reproducible from one heat to the next, despite the fact that the laminations range from 1½ to 14 in. in diameter and from 0.010 to 0.085 in. thick. Production capacity is limited only by the speed with which the hanger-type fixtures can be loaded and unloaded.

Laminations are treated in neutral salts in an Ajax austenitizing furnace at selected temperatures from 1500 to 1600 F, then transferred immediately to a neutral-salt quench at 400 to 450 F. Immersion times and exact temperatures are determined by the size, type, thickness and desired characteristics of the parts.

Many applications

This original application, however, was only the beginning for this salt-bath installation. Soon many other clutch parts were passing through it—bearing races, slip rings, bushings. Today, all these parts, and many more, are heat treated just a few feet from the lines where they are subsequently assembled. In fact, work volume increased at such a rate that, six months after the original installation, another furnace, an Ajax carburizing furnace, was added.

After their modest beginning, these furnaces now run almost continuously. Their applications are many and varied:

- Annealing of copper ground straps for electrical equipment;
- Heating of carburized rings prior to shrink fitting;
- Stress relief annealing of steel pins;
- Martempering of tools and fixtures;
- Experimental brazing in suitable fluxing salts

The furnaces are among the most versatile pieces of equipment in the shop. In addition, they require little maintenance, provide accurate, uniform results with no need for highly skilled operators, and have built up an outstanding safety record. But most important of all, they give I-T-E closer in-plant quality control of the critical hardening operation.

American Machinist

EXPLOSIVE FORMING...

...how it works, what it does

Special Report No. 474 June 15, 1959

High-energy-rate forming shows advantages in economy where workpieces are extra large, complicated in shape, and made of especially tough materials. The state of the art is still largely experimental, but many prototype parts in all sizes have been made, and some few parts are now in production.

This new technique takes the kill out of explosion and applies the push—and there's plenty of energy available to push around any kind of material. It works three ways: Free forming is the method by which parts are formed without dies, or with open-end dies (see sketch, top right). Bulkhead forming requires a formed die, sealed off from the water that carries the shock wave, and either air-filled or evacuated (middle sketch). Cylinder forming pushes the work radially into a shaped die, and is often applied to form special tubing.

These techniques are detailed in the following four articles from four major sources: one on general theory, one on aircraft applications, one on tubes and one on cups . . .

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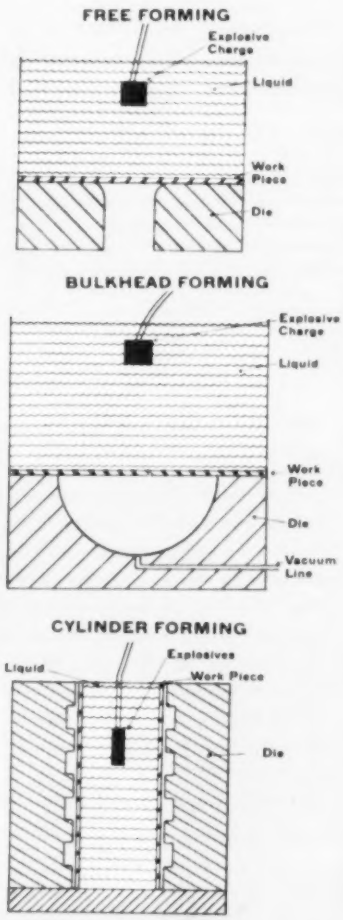


A—Small die tests technique. Diameter indicated by arrows is 1⅜ in. Part in foreground is hemisphere formed in die

B—6-in. die tests explosive, forming hemispherical or elliptical heads in test metals

The theory and practice

By Dr Robert A Cooley, executive vice president,
Propellex Chemical Div, Chromalloy Corp, Edwardsville, Ill.

EMF—explosive metal forming—is a new and not-yet-exact science that forms metal to die shape by explosive impact. The explosive charge is a form of stored energy that can be released (detonated) to move the metal workpiece — sometimes into shapes that cannot otherwise be economically produced any other way. It has the function of a press operation, but it can exert higher pressure faster, and it is often less expensive.

Success of Russia's Sputnik I touched off widespread interest in revolutionary methods of forming and fabricating, including EMF. Up to that time interest was at best lukewarm, and the process was considered impractical by many. But the Sputnik scare, with its "What have *our* scientists been doing all this time?" reaction, gave EMF its greatest development impetus. The method became one solution to the problem of forming complex metal parts for America's missiles. Explosive forming proved particularly successful in expanding cylindrical shapes to the close tolerances and aerodynamic smoothness.

Typical parts

Fundamentally the system has four elements: (1) a metal blank to be formed or expanded, (2) an explosive charge, (3) a die—or perhaps no die because free forming is also possible, and (4) a medium (usually water) that will transmit the explosive energy.

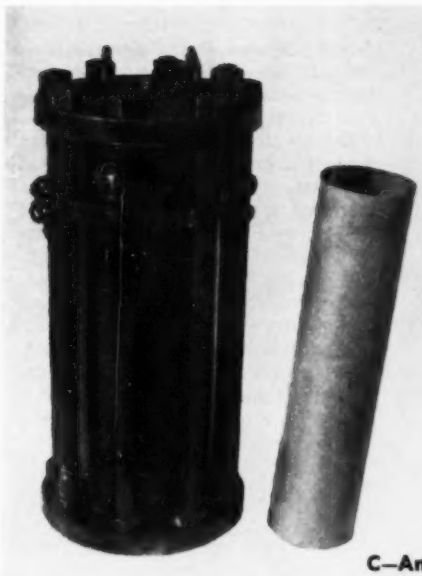
One of Propellex's earliest projects was to perfect a process that would straighten and expand rocket-booster cases 18 in. in diameter and 11 feet long. At this early stage tolerances of ± 0.02 in. were met.

More recently Propellex has been at work on an EMF process to form fuel tanks for Boeing's IM-99 Bomarc missile (Photo G). The tank is welded up from high-strength alloy steel and is heat-treated. It is loaded into a two-piece die which is filled with water. The explosive is fitted with an electric detonator and lowered into the die. On explosion, the

Bibliography

More on explosive and other high-energy-rate forming can be found in earlier issues of AMERICAN MACHINIST:

Explosive Forming Goes Over With a Bang—Apr 6 '59, p 120
Convair Reports on High-Energy Forming—March 23 '59, p 126
Explosive Forming—Successor to the Heavy Press?—Dec 29 '58, p 47
Revolution in Metalforming—Nov 17 '58, p 123
High-Energy Machine Tool Forms Metals at Explosive Velocities—Nov 17 '58, p 239
Explosives Press-Form Difficult Shapes—April 21 '58, p 137
Shock Forming with Explosives—Jan 14 '57, p 110
Explosives Fabricate Metal at Lockheed—Jan 14 '57, p 112
Energy Alone Isn't the Answer—Jan 14 '57, p 114
Shock Simulator Shows Promise—Apr 23 '56, p 124
Blast It—Oct 25 '54, p 173
Gunpowder Deserts Mars for Vulcan—Feb 6 '30, p 245



D—Process-development die lead to success in straightening and expanding 11-ft-long rocket-booster cases

C—Another test die checks refractory metals. Length is 2 ft, ID is 6 in.

# of explosive metal forming

charge generates a pressure wave and a gas bubble, which develop pressures as high as 1 million psi in a few microseconds.

This and similar methods now applied on missile components will one day lead to EMF operations on nonmilitary products.

Parts of many varying sizes and shapes can be formed explosively, as indicated by the accompanying photographs. One is a 1⅜-in. die that forms small hemispheres (A) in which metal alloys are tested for their suitability to EMF processing. Another forms 6-in. hemispheres (B). Tubes with a 6-in. OD and length of 24 in. are formed in a third die (C). Larger tubes, 18 in. in diameter and 24 in. long, are also formed (D). EMF bulges 4130 tubing that has been rolled to relieve stresses (E). This die increases diameter of the tube from 17½ to 18 in. ±0.020 in. Another die produces tubes with a 36-in. OD, 144 ft. long, from 4339 heat-treated stock.

Determine forces

Quality of performance for EMF is determined largely by the explosive charge. The quantity is most important when the operation is in a closed die or is free forming. The charge shape determines the emitted energy pattern and the pressure-time performance. And the detonation velocity of a high-explosive charge can be varied by a factor of two by selecting its chemical composition (see table below).

Explosives vary greatly in metal-forming power. Blasting gelatin may have a detonation velocity as low as 2000 meters/second or as high as 7500 meters/second. Detonation velocity depends on the density of the charge. Relative densities and velocities can be compared in the following table, where D is density, V is velocity:

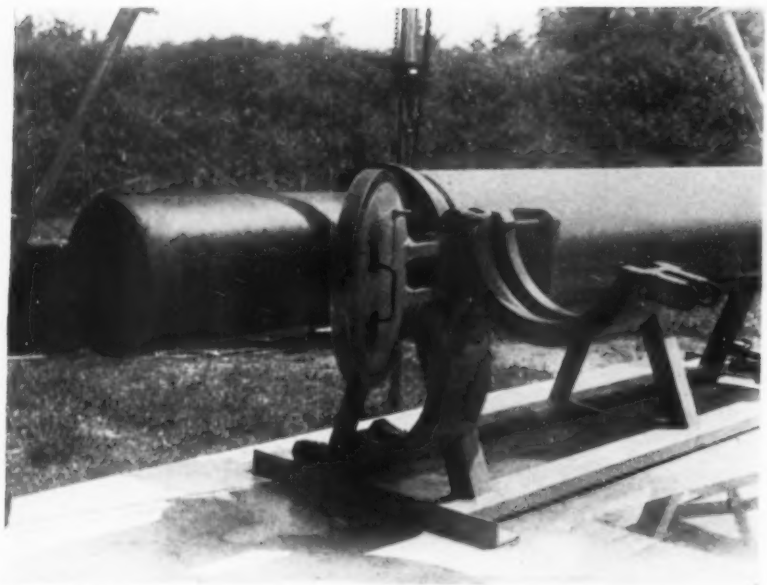
	D	V
TNT	1.00	5010
RDX	1.00	6080
Comp A	1.6	8180
Ammo picrate	1.00	4949

The explosive charge may be a cylinder, sphere, cord, or sheet. Patterns of energy, impulse, pressure, and detonation also depend somewhat on any booster charges and the primer with propellant charges.

Propellex has tried about ten dif-

General Characteristics of High and Low Explosives

	High Explosive	Low Explosive
Method of initiation	Primary high explosive by ignition spark, flame, or impact. Secondary high explosive by detonator and booster.	By ignition
Conversion of explosive to gaseous products	10^{-6} sec	10^{-3} sec
Linear consumption rate	5680 to 34,080 ft/sec	1 ft/sec
Velocity of flame front	5680 to 34,080 ft/sec	1893 ft to 5680 ft/sec
Pressure of explosion	50,000 to 4 x 10^{6} psi	50,000 psi
Rock breakage in bore-hole blasting	1 to 60,000 lb/lb	1 to 60,000 lb/lb
Properly initiated in a gun	shatters the gun	performs satisfactorily
Forming metals	applicable	occasionally applicable



E—Rocket-booster-tube die produces part 11 ft long, 1½ ft in diameter

G—Heat-treated fuel tank is loaded in split die; formed for IM-99 Bomarc. Charge is detonated electrically by remote control

ferent high-explosive compositions for particular jobs, and picks the one that seems most promising for the final result desired.

Excess charge is usually included when the job is at an open die, but the waste is unimportant because the material is relatively inexpensive. But too much charge in a closed die may destroy the tooling. Fortunately the charges can be scaled up to necessary size for each job by applying theory developed from evaluation of explosive bombs tested in the past. The Kirkwood Bethe theory predicts peak pressures at points ten to one hundred charge radii from the charge:

$$P_m = k\left(\frac{W^{1/3}}{R}\right)^x$$

where P_m = peak pressure
W = pounds of explosive in charge
R = distance from charge in feet
x = a constant characteristic of the explosive
k = a second constant for that explosive

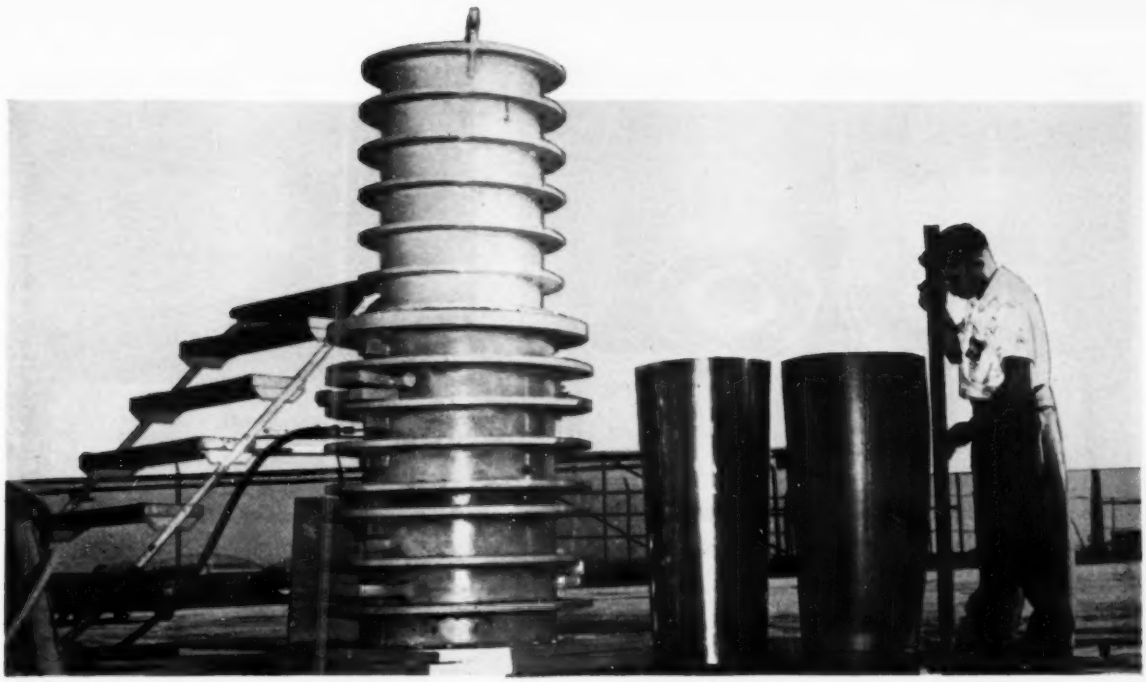
Press materials

Dies for EMF are usually metal, but a variety of other materials including plastics reinforced with glass fibers or metal have been applied. The die shown in Fig. E weighs about 7 tons.

Early EMF experiments permitted water to be blown out of the dies, but there is an increasing tendency to partly or completely close the die so nothing is blown out. The two dies mentioned above performed satisfactorily indoors without blowing out water.

Noise is absorbed somewhat by the water and die, and it would not normally interfere with machine-shop operations. During development work safety precautions should be taken to protect personnel and property from firing damage, but after details of charge size and shape and technique have been worked out, the hazards of EMF are no greater than for many other industrial processes.

If explosive charges are stored by metal-forming plants in the same fashion as current users of explosives, we can predict no more than three disabling injuries per million man-hours of work. Handling the charges from storage to point of application in the forming plant is where attention to safe techniques is most important.



Explosive formed tank section at right is 1/16-in.-thick aluminum, made from straight-sided cone in the center. Split die at left was originally designed for experimental purposes, hence the heavy construction. Top section dampens noise.

EXPLOSIVE FORMING

. . . the planemaker's newest, hottest tool

By George H DeGroat, Detroit editor

Explosions and implosions produce aircraft parts at the Columbus, Ohio, division of North American Aviation, Inc. Development work on high-energy-rate forming has produced useful data that has been successfully applied on two production parts.

Three years of study have indicated that better parts can be made with high-energy-rate forming, and at lower cost than with conventional equipment, even if it can be beefed up enough to take the high loads required, which is not always possible.

Use of High Explosives

Current work has been done with high, rather than low, explosives. RDX (Research Development Experiment) high explosive compounds such as Cyclonite, Primacord, and PETN by DuPont appear to be best for forming because of the instantaneous action that occurs. With high explosives, there is no lag that permits thin sections or other flaws or defects in a non-uniform sheet to move before heavier sections start. Not only do high explosives require the smallest investment in tools and dies but they are also safer than other explosives and have no toxic effects. RDX, for example, is not easily detonated and can be pounded, cut to shape, or even crushed.

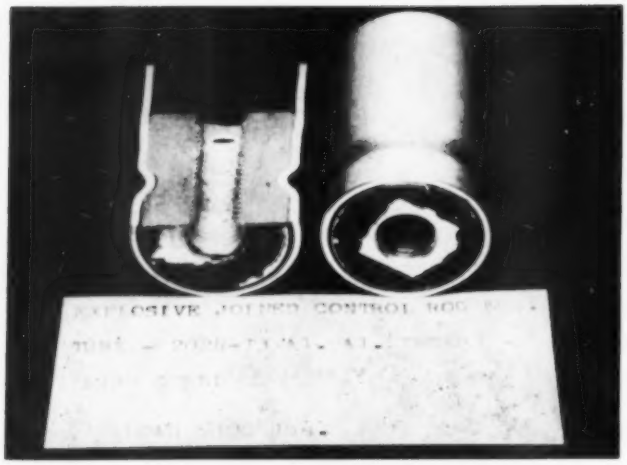
Water is employed as a force conductor and also as a shock dampener in this work. Safety considerations are thus taken into account, too, because underwater detonation permits practically no air or ground shock and eliminates the possibility of flying particles. No toxic or irritating compounds can contaminate water as is possible in air. In water, however, the shape of the charge has a definite effect on the pressures obtained.

Shaped charges in the form of pellets, cord, and sheet are used for various purposes. RDX pellets, for example, produce a spherical force pattern useful in forming or the final sizing of small parts; setting a flange or embossment in a minor area of a large part; or for expanding a tube or tank section. When a large area is to be formed, a distribution of pellets to provide a closely spaced pattern of overlapping force spheres will minimize wrinkling. However, each explosive pellet or cluster of pellets on a common center requires a detonating cap. Since the detonation of all the pellets must be timed exactly for the same instant, arc fired electric caps are necessary. These are expensive to apply and are reserved for experimental work.

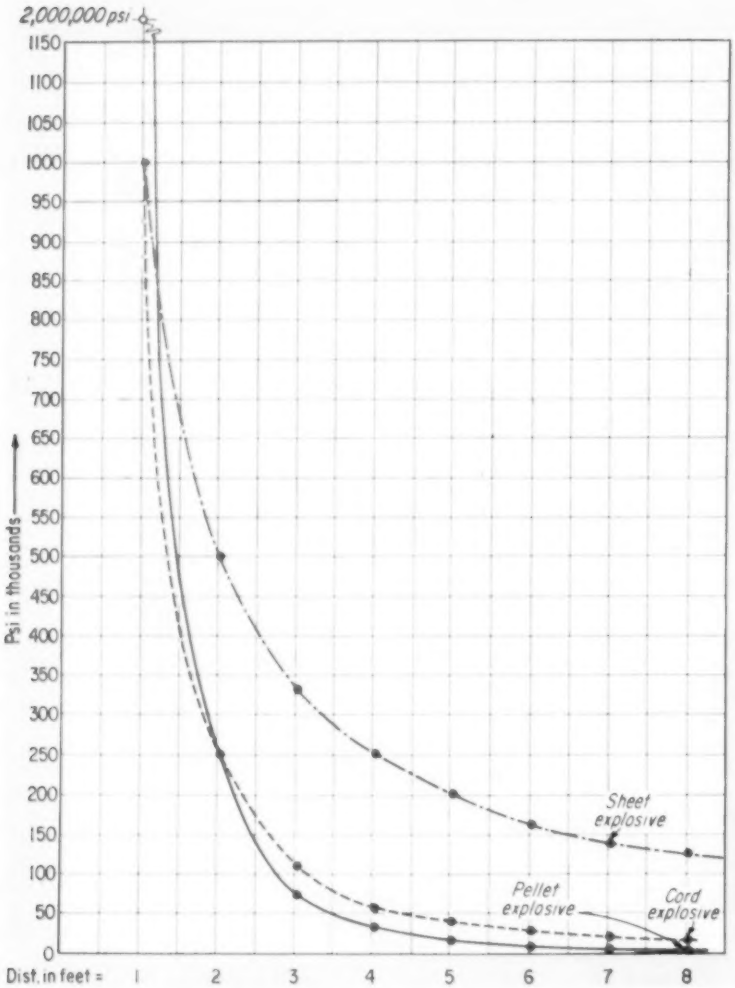
Pressures Vary With Shape

With the RDX or PETN pellets, the pressure obtained at explosion is inversely proportional to the *cube* of the distance between the charge and the surface of the work. If a 10-grain pellet, for example, produces the desired force to form a part at a distance of x-in., then at a distance of 5x-in., the charge must be 10 grain times 5 cubed, or 1250 grain.

Pressures obtained with the high-



Implosive forming assembles plugs inside tubular control rods. Primacord ring around one end of a tube is detonated under 3 ft. of water to produce a compressive force that swages the tubing around a groove in the plug. Parts with double grooves illustrate former design that required pressing or rolling mating grooves in the tube.



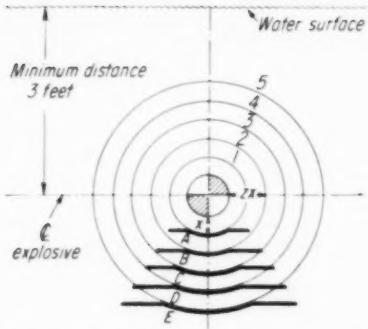
Pressure drop as the result of increased distance from the explosive charge to the surface of the work varies with the shapes of charges. These curves are based upon observation of current high explosive tests at North American

explosive cords, or cylindrical charges, are inversely proportional to the *square* of the distance between the work and the charge. Cord shapes are especially useful for forming special contours, beads, or difficult angle flanges since they can be shaped to follow these profiles.

Sheet, or panular, charges in various thicknesses and contours allow an exact application of force where it is needed since RDX sheet can be doubled up, shaped, and cut as necessary. Flexible sheet elminates the spherical pattern obtained over large areas by pellet charges. Unlike with the spherical and cylindrically shaped charges, pressures decrease directly in proportion to increased distance between a planular charge and the work surface.

An indication of the forces used in forming at North American may be had from the fact that one gram of Cyclonite delivers approximately the same as that developed by one gram of nitroglycerine. In the immediate vicinity of the explosions, a 10 grain RDX pellet develops a pressure of about 1300 psi. Velocities of shock waves through water run about 20,000 to 25,000 fps.

With these speeds it is necessary to evacuate air from forming dies to avoid bulging or dimpling the work. The explosive force moves so



Effect of distance on forming with spherical, or pellet, charges, shows that at distance x the part is sharply indented with a small radius at A. Subsequent movement of the part under a diminishing force may fail to remove this effect. Increasing the distance between the charge and the work surface, (2 through 5) decreases the sharpness of the radius as the radius of the force sphere increases, A through E. Radius of E would disappear as the part reaches its final form.

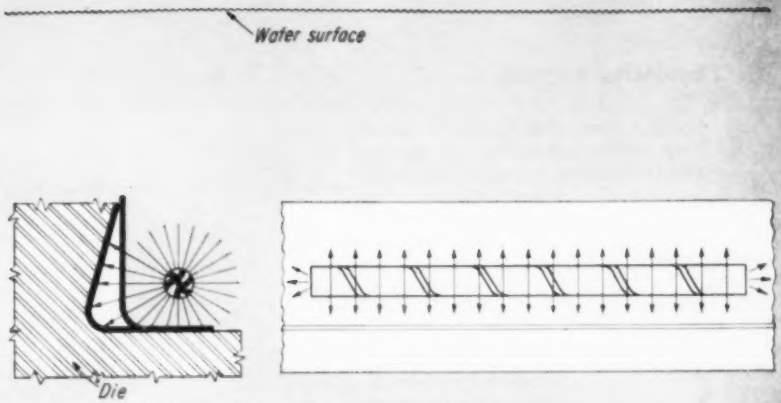
fast that air has no time to leave the die unless it is pulled out beforehand. Result is that it compresses and explodes back, deforming the work. In the tools now in use, about 80 to 90% of the air, at least, is removed prior to detonation. A two-step procedure is followed in forming very thin material. First consists of an initial air evacuation and the explosion followed by a secondary evacuation and another explosion.

Die finishes are critical too. At these forming speeds, a drop of water or even a pencil mark on the surface of the die will appear on the part. Tear-drop shapes have actually appeared in depth on formed sections as the result of a leak drop that had no time to collapse. Consequently, dies are not only finished within the requirements of the work to be formed but are also checked for such intrusions.

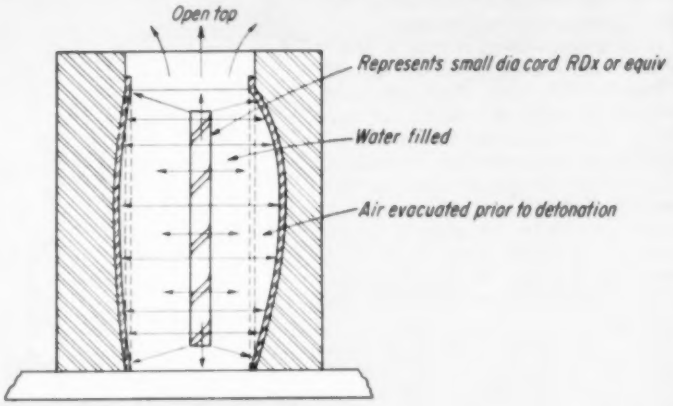
Explosive and Implosive Forming

Forming of tank sections now being built at Columbus for the U. S. Navy is one of the first experimental applications of the high-energy technique. The part is a truncated cone made up of one piece seam welded together before explosive forming.

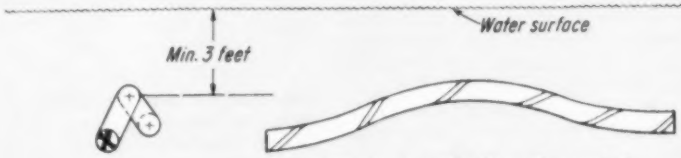
The explosive forming die is essentially two mild steel shells, or halves, forming a cylinder about 3 ft. in dia by 4 ft. high with a wall thickness of 1 in. Inside the cylinder is a cast liner made up of an Epoxy resin and pea gravel mix shaped to the desired contour. A Fiberglass coating about ⅛ in. thick is applied over this die contour and is sealed with an



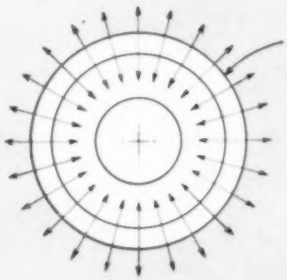
Cord parallel to closed angle flange or bulge area



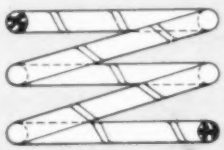
Split die tank or tube bulging



Cord may be shaped to ML or other controls for difficult-to-set angle flanges or beads



Applications of cylindrical charges include both implosive and explosive effects. High explosive cord provides a high degree of flexibility in following any contour.



Detonate under water @ 3 ft min.

Explosive forming . . .

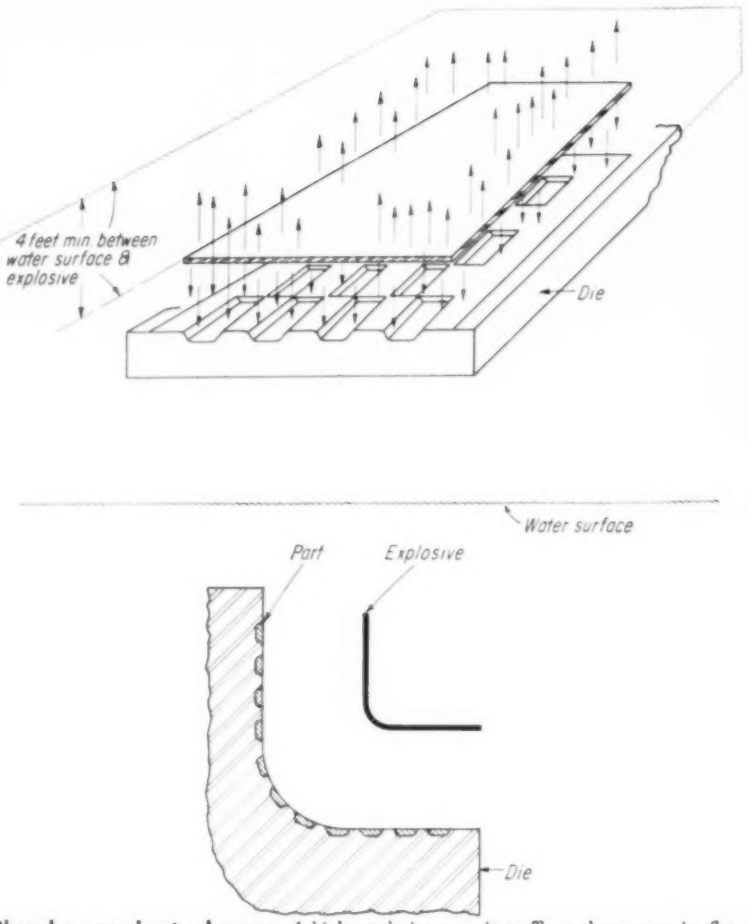
epoxy surface coat to protect the die from water absorption. A vacuum line is provided to remove air before forming. To increase the water column and dampen noise, a top cylinder is added. About 1½ ft. of Primacord is used as the charge. This material contains about 40 grains per ft, thus providing about 4 gm of explosive.

With this setup, a tank section is expanded by outward force from a straight side cone to the mold line of the prescribed tank. Removal of the finished part is facilitated by the split construction of the die.

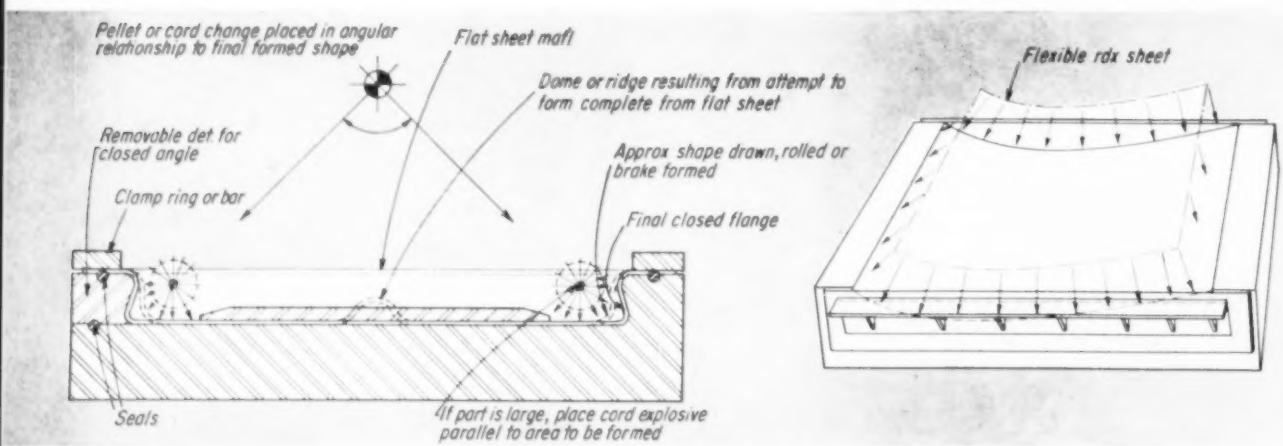
An implosive effect is used to firmly assemble a plug inside the end of a control rod tube. This assembly previously required a double groove design in the plug and the two components were assembled by rolling or pressing mating grooves in the periphery of the tube. Now, with a single groove in the plug a better assembly is made. None have ever been pulled apart. In fact, the tube usually breaks before the plug can be dislodged.

This job is accomplished by placing a Primacord ring around the tube at a point above the groove in the plug. The resulting compressive forces, or implosion, produces the necessary groove in the tube to lock the plug in place.

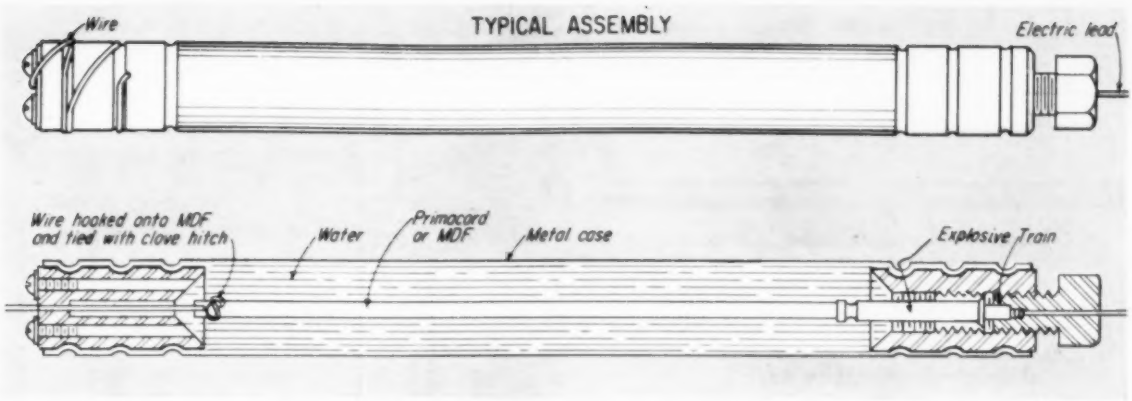
Procedures for the standardization of explosive forming will be planned, tested, and evaluated for effectiveness, safety, cost, and rates of production. NAA engineers are confident that a number of other vital parts can safely be assigned to the explosive forming production group.



Planular, or sheet, charges of high explosive permit waffle embossments in flat stock—and even a combination of these embossments with a contour. With an air-evacuated die under water, the sheet is positioned to present shock perpendicular to the contoured surface. Arc fired caps would be employed according to the size of the sheet to insure overall instantaneous detonation.


Pellet or cord charge placed in angular relationship to final formed shape
Flat sheet matl
Dome or ridge resulting from attempt to form complete from flat sheet
Removable det for closed angle
Approx shape drawn, rolled or brake formed
Clamp ring or bar
Final closed flange
Seals
If part is large, place cord explosive parallel to area to be formed
Flexible rdx sheet

Forming closed angles, or flanges, without wrinkles or springback is facilitated by a plate positioned on a preformed part, left. Flexible sheet charges provide planular shock wave effects, right.



1—Free forming works without dies. Water and explosive are trapped inside the work to expand it to size determined by characteristics of the work and the explosive. End plugs confine pressure

Explosives form tubes with and without dies

By Jacob Savitt, supervisor, Explosive research
Armour Research Foundation, Illinois Institute of Technology, Chicago

Why the recent concentrated attention on explosive forming? There are some very good reasons why it should be investigated right now:

1. Exotic tools that use convenient, efficient explosives as small-size energy packages are being built and applied now.

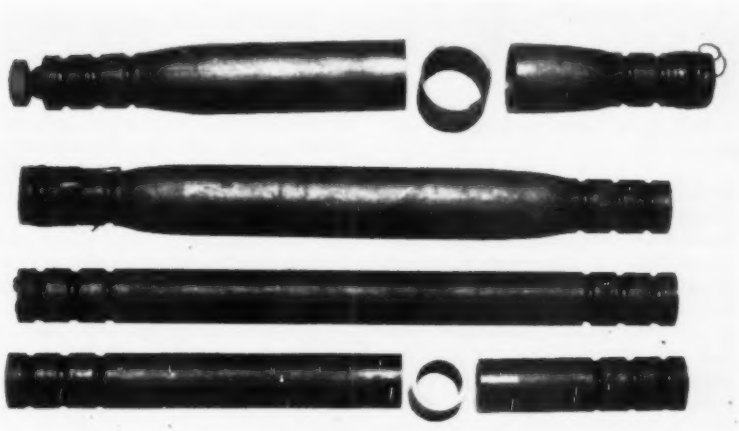
2. Many large and/or complicated shapes in conventional metals, such as mild steel, can be formed economically with explosives.

3. Some new high-strength, high-temperature metals can be formed into missile-age contours *only* by explosive forming.

4. Explosive handling is no more dangerous than handling other modern tools; in some cases it is safer.

5. If you fail to apply explosive forming, your competition may not.

Explosives release energy suddenly to develop pressure pulses as high as 1,000,000 psi—more than enough to deform the strongest metals known. If the interactions between the explosive and a workpiece are controlled—relative masses, dimensions, and geometry—the pressure can be made to form parts.



2—Before and after—cartridge-brass tubes are expanded to increase diameter and reduce wall thickness

Free Forming Expands Tubes

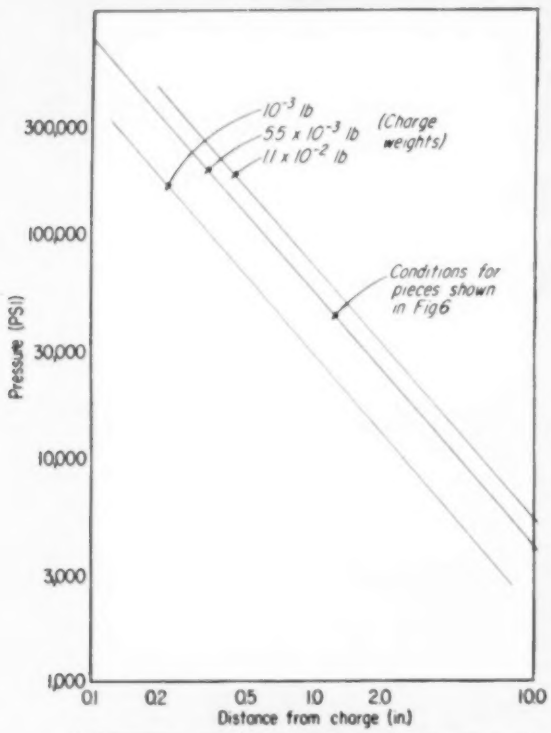
High explosives can be detonated to produce repeatable pressure pulses, and the metal workpieces respond uniformly to the pressure, so production operations can be continued without punches or dies.

One example is a metal tube, on which the diameter must be enlarged and the wall thickness reduced (Figure 1). The explosive charge for this job is Ensign-Bickford primacord rated at 100 grains/ft. This is centered axially in the tube, the tube is filled with water, and the tube is sealed, as shown, with end plugs. An electric detonator (small compared with the charge) is added to initiate the explosive train. The entire assembly is immersed in a water bath and is detonated.

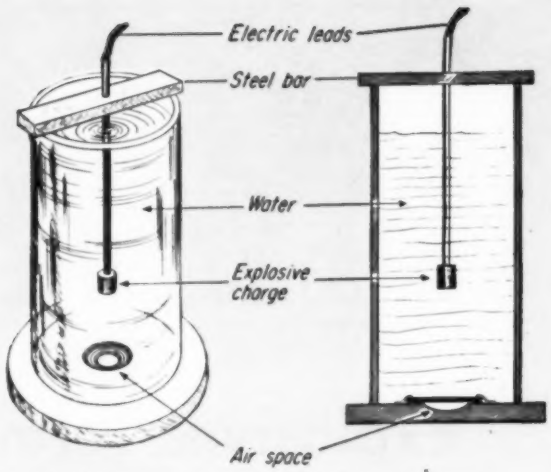
Before and after photos (2) show that the tube expands without rupturing. The tube is dead-soft-annealed cartridge brass with an original OD of 1.002 in. with walls 0.084 in. thick. The final OD varied between 1.33 and 1.34 in. over more than half the original 12-in. length. Final wall thickness was reduced about 0.060 in.

A similar technique works on stainless-steel tubing, which was expanded by mild detonating fuse with

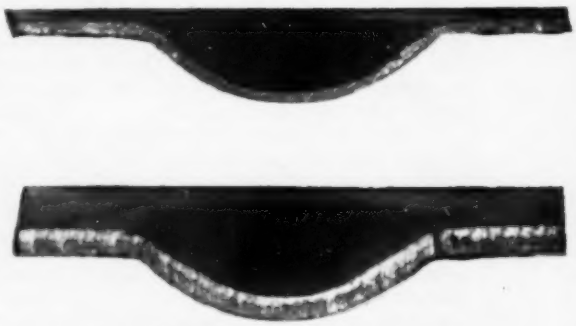
3—Expanded 304 stainless tubing has practically uniform new diameter and wall thickness through most of its length. Ends are not expanded because of plugs and because explosive cord is confined to middle areas



5—Pressure vs distance from charge to work produces straight-line curves on log-log graph paper. This allows scaling up for larger work



4—Simple cup is formed at bottom of water-filled container. Note water is sealed out of die



6—Cross-sections of die-formed cups in two thicknesses show good die shape, no damage to stock

10 grains/ft (3). The original OD was 0.252 in., which was expanded to 0.300-0.303 in. Wall thickness was reduced from 0.035 to 0.027 in.

These two examples show what can be done at a simple setup without complicated explosives. Better control of explosive and attenuator design should result in improved reproducibility.

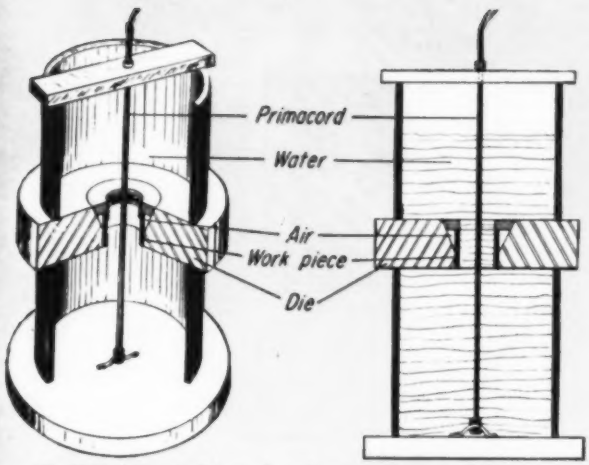
Free forming also works to produce more complicated shapes if the geometry and/or the points of initiation of the explosive charge are controlled. Explosion effects and workpiece behavior may be scaled up or down, so there is no theoretical limit to the size of parts that may be explosion formed.

Dies Confine the Work

A system for forming sheet metal against a die is only slightly more complicated (4). The tool includes a container, die, an explosive charge, and water to transmit the shock waves. The charge is arranged so its size and location can be adjusted, depending on the material to be formed, the thickness of the work, and the depth and shape of the die. Pressure buildup at the work is indicated in the chart (5)—it is a function of both distance between explosive and work centers, and the weight of the charge. In some cases it may be necessary to evacuate the open die space under the work to prevent springback.

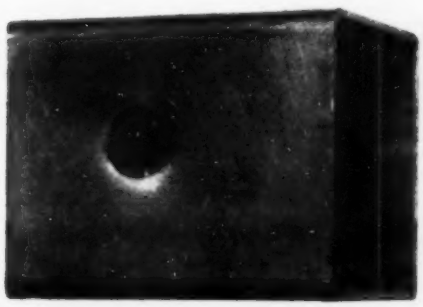
Typical results with a cup-shaped die are illustrated (6). The original pieces of mild steel were 0.052 and 0.104 in. thick. These were formed into sphere segments—sections are shown. The dies were 1⅛ in. in diameter and ¼ in. deep. Peak pressure at the work was in the order of 25,000 psi.

Nozzles as well as cups can be formed (7). Water is the shock-transmitting medium, but the die space

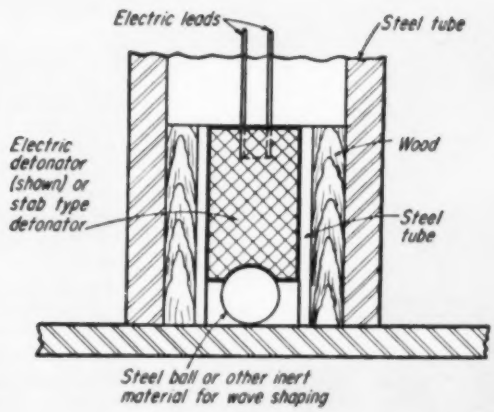


7—Nozzles are formed underwater by explosive force directed radially out from cord explosive. Die space here is also cleared of water

8—Before and after for nozzle illustrates clean forming job. Explosive forming is much simpler than conventional methods



10—Hole punched in 1/16-in. steel is 0.30 in. across. Bearing ball was ¼ in. in diameter



9—Explosion cutting works because steel ball directs shock wave through bottom plate. Wood around steel tube has resilience, will not shatter

behind the work is either filled with air (to remove water) or evacuated. The original mild-steel cylinders were 1 15/16 on the OD and 2 in. long with 1/16-in. walls. Before and after views (8) show how the maximum nozzle diameter was expanded to 2½ in. The explosive charges were 100-grain/ft primacord lengths.

Results with small sample systems such as these can be extrapolated to different scale—in fact, shapes 20 ft in diameter have been formed.

Cutting and punching

When the intensity of the explosion is controlled, it is possible to form rather than shatter metals. In addition, when the geometry of the pressure wave is controlled, it is possible to cut as well as form metals.

One simple system (9) shapes the explosive force to punch simple holes in heavy sheet or plate (10). There are explosive hole punches now on the market that work with low explosives (propellants) which provide the energy to push a metal punch. But high-explosive punching, in this case, is done with the direct force of explosion. The steel ball simply shapes the pressure wave to produce high-pressure jets.

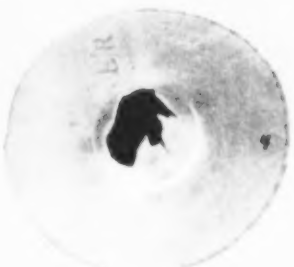
This system is simply for illustrative purposes. Further experience may result in higher effectiveness and should reduce the quantity of explosive required for given results. Greater precision undoubtedly will be possible, even though no shaped punch is applied.

These cutting and forming tools are of no special commercial value as shown, but they indicate that tool design for explosives, particularly where work quantities are small, and work sizes are large, can result in appreciable savings. For some parts above a certain size, explosive forming may be the only economical means of fabricating.

1

2

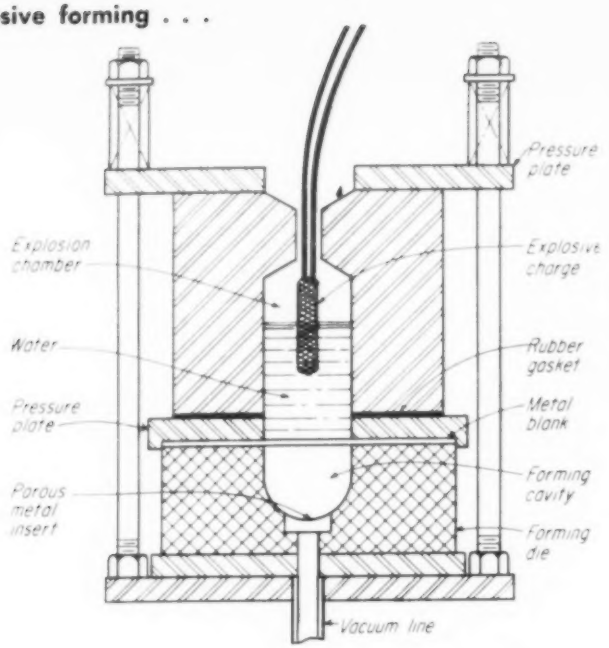
3



4

5

Explosive forming . . .



Test fixture (above) is put together with pressure plates, steel ring that retain explosive forces. Sample cups (left) show varied results with tough alloys

Explosives form Titanium, too

By Thomas A Dickenson, Los Angeles

Tough new alloys like 6A1-4V titanium can be explosion formed in a universal tool that takes replaceable dies. This equipment is applied by Lockheed Aircraft Corp, Burbank, Calif, to produce experimental cups with 2-in. diameters from 6-in.-dia blanks.

Tests show that most metals can be elongated 25-75% more with explosive forming than is possible by conventional means. At the same time they undergo so little work-hardening that they often require no annealing, and springback is so slight it can be called insignificant.

The explosion tool is a hollow steel casting that is assembled over a workpiece and female die with a pressure plate and spring-tension fittings. The casting retains water that transmits energy from the detonated charge. No cover is applied because the cavity is designed to concentrate explosion pressure first on the work—then allows expanding gases to escape.

Dies are made from air-hardening tool steel, Kirksite, and epoxy plastics. A porous metal insert in the bottom of the die, and a vacuum-line attachment, allow evacuating the space under the blank so no air compression will affect the shot.

Explosive applied is DuPont PETN, 1.60 grams produces 3,234,000 psi.

One of the important reasons water is loaded into the die, besides the fact that it transmits explosive shock well, is to prevent the tiny copper blasting-cap particles from penetrating the work. These speed along at more than 20,000 fps, and might easily penetrate sheet stock.

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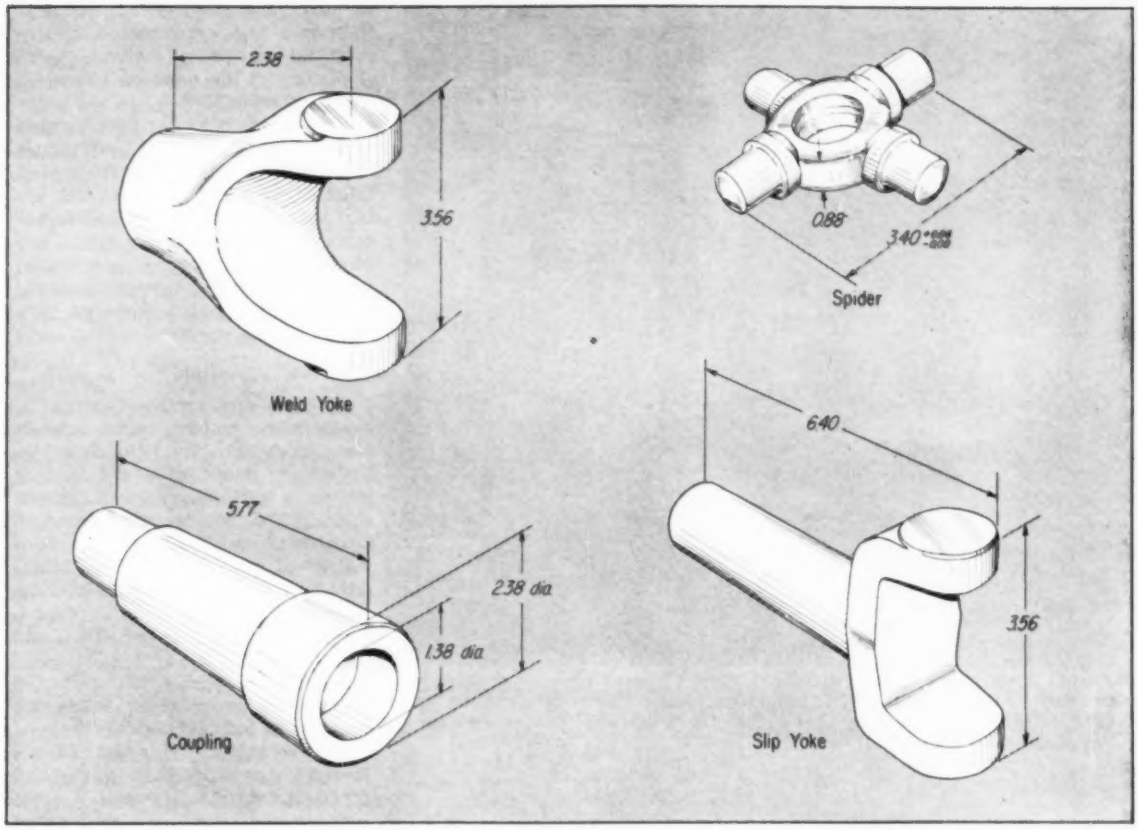


Forging goes automatic . . .

. . . at Saginaw Steering Gear Division of General Motors Corp, where highly mechanized lines have been installed to forge automotive propeller-shaft parts. Production rates run above 1000 per hour for the simplest and over 350 per hour for the most complex of four different parts

By George H DeGroat, Detroit editor

Automatic machining and inspection are common enough in the automotive industry, but here's a plant where the principles of automation have been extended all the way back through the forge shop and right to the bar-stock supply.

Each of four automatic lines at the Saginaw Steering Gear Division of General Motors Corp makes its own part—a universal-joint spider, an externally splined slip yoke, an internally splined coupling, and a weld yoke. After forging, machining, cleaning, and inspection, the four parts are assembled with prop shafts for Cadillacs, Buicks, Oldsmobiles, and Pontiacs.

The forging setup at the head of each machining line is a judicious mixture of automatic feeders, loaders, unloaders, and mechanized materials-handling equipment — with manual operations where an operator's skill cannot be duplicated mechanically. The kind and amount of automatic equipment varies according to the requirements of the different parts.

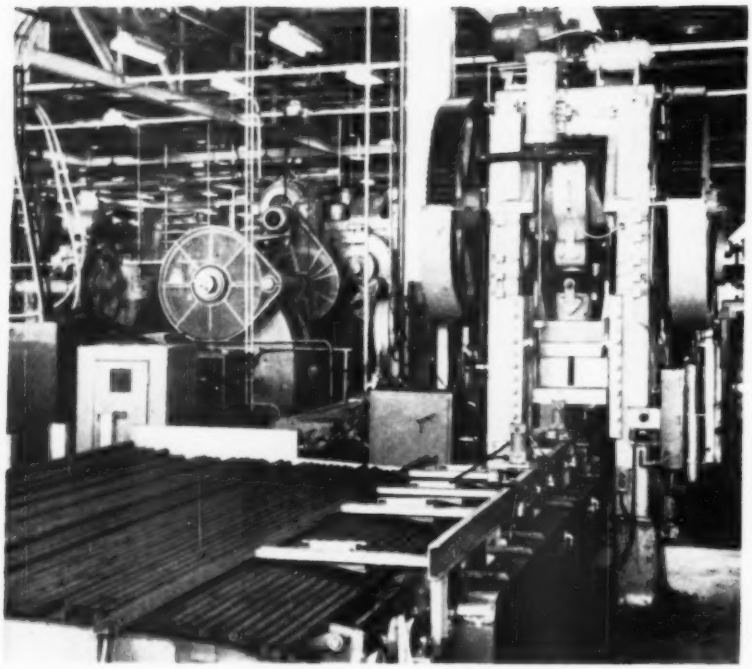
In the stores area, the lines are almost identical. All raw material (steel bar stock) is unloaded from railroad cars at a siding inside the building and is distributed to storage racks. The racks head up the lines and receive stock according to the type of steel and bar size needed for each part.

Modified SAE 6115 stock, 1½-in. in dia, is delivered to the spider line while 1½-in.-dia SAE 1141 bars are brought to the slip yoke line. The weld yoke and coupling are both made of 1⅞-in.-dia SAE 1151 bars.

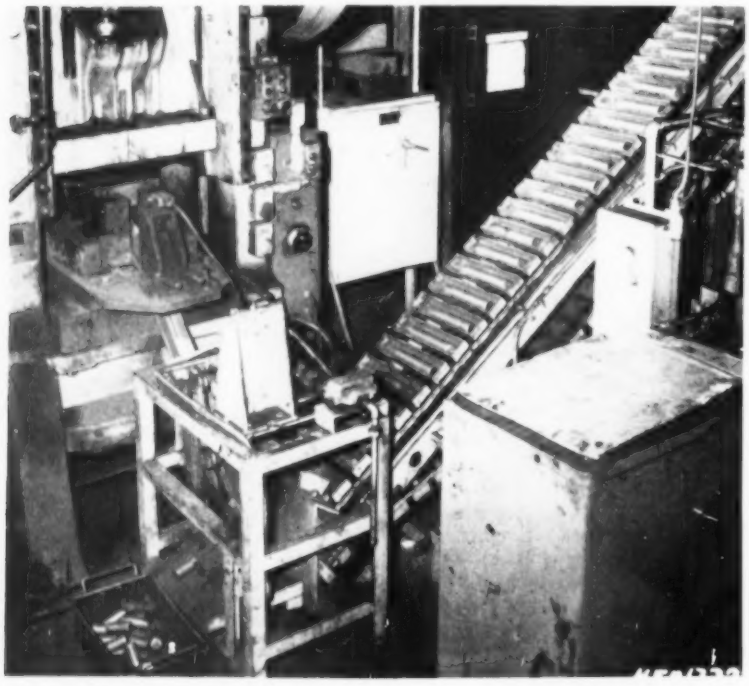
Automatic stock delivery

At the start of each line the bar stock is automatically delivered to shearing presses. From here, the sheared billets are conveyed to induction heaters where one section, or the whole length, is brought up to forging temperature—between 2050 and 2250 F.

At this point, differences begin to show up in the equipment and techniques on each line because of variations in part geometry and material.



Bar stock is delivered automatically to 90-ton Cleveland press for shearing into billets. Bars are gravity fed to rollers; reciprocating loader delivers them one at a time. Each of the four automatic forging lines starts out with this kind of cutoff operation in the bar-stock storage area



Billets drop out of shearing press and bucket conveyor takes them to induction heater. Conveyor is loaded by split kicker that lets short bar ends drop through into box. At the induction heater, prescribed sections of the billet are raised to forging temperature. Temperature is checked by a photo-electric cell before the billets go into the press

However, the basic arrangement is the same. The operations on the slip yoke line will serve to give a general picture of the methods employed on all of them.

The induction heater for this part has a hairpin coil that heats about one-half the billet length. The heated billets then pass a photo-electric cell that automatically checks and segregates them. Overheated parts are directed to a scrap pan; underheated parts are re-routed through the coil; and properly heated parts go to a National 4-in. upsetter.

Alternate upsetting

Here, five dies, arranged vertically, progressively upset, split, rough form, finish form, and trim the yokes. Billets are delivered to the loading station on alternate cycles of the machine. Then they are transferred to successive positions by means of automatic, vertically operated feed tongs. As a result of the alternate loading, billets are being worked in dies 1, 3, and 5 in one cycle and dies 2 and 4 in the next.

Automatic ejection through the bottom of the machine takes the parts to an inclined bucket conveyor under the floor. This carries the forged yokes above the machine and across the aisle to a furnace. Since the upsetter outproduces furnace capacity, the parts are frequently stored in boxes until the furnace can handle them instead of being loaded directly into the furnace.

A unique method of separating the trimmed flash from forged parts is handled by baffles in the chute. These direct the flash through openings while the forged parts pass on to the end and into the box.

Other parts are press forged

The other three forging lines are similar — starting with automatic shearing and ending at the furnaces. However, unlike the slip yoke, the other parts are forged in presses instead of an upsetter.

In addition, the heated spider billet is run through a National No. 4 Reduceroll before forging. This machine necks the billet down at three sections to produce four separate diameters.

An operator then loads the reduced billet into a 4-cavity blocker die in a National 1300-ton Maxipress where it is struck once. Next, it is transferred to an adjacent 4-cavity finisher die for one more strike.

Then the finished billet is fed to a 125-ton Bliss press next to this setup. Here, an operator produces two

spiders at a time with a trim die. Parts are pushed through this die and into an inclined conveyor for delivery to the furnaces.

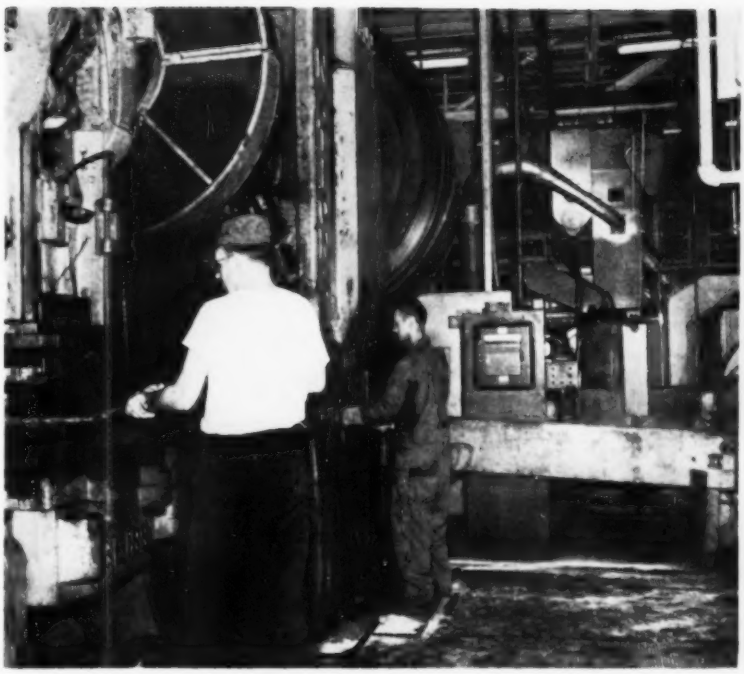
Weld yokes are handled in much the same manner except that a Reduceroll produces three sections in each billet instead of four.

Couplings are descaled

Billets for the couplings go through a special descaling operation after they leave the induction heater. In a Commercial Shear and Stamping Hydra Jet unit, water at 1500-psi pressure is applied to the billet as it is forced through a ring. After descaling, the billets are transferred to a National 1000-ton Maxipress where forgings are made in three passes, one pass in each die.

Here, an operator removes a billet from an automatically loaded blocker die (where the outside form is produced) and loads it into the second die. This pierces a hole halfway through and finishes the outside contour. The third die, also manually loaded, pierces the balance of the hole.

The finished part is stripped from the punch at the third die by a stripper plate and is almost simultaneously picked up by an ejector arm that drops it into an inclined conveyor for transfer to the furnaces.



Manual operations are still important. Here, the man at right receives spider billets after they are necked down at three places in Reduceroll and loads them into 4-cavity blocker die and then into finish die. Man at left places finished billets in trim press to produce two parts at a time

Good die life

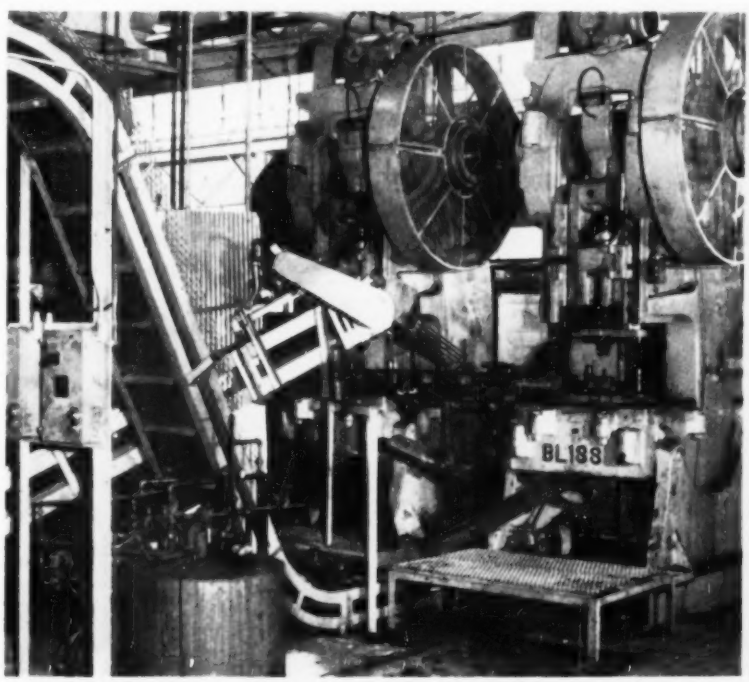
Die life in all setups is good. For example, the 4-cavity blocker die used in forging spiders produces about 40,000 pieces before being re-sunk, and it can be re-sunk about five times before being completely worn.

About 30,000 pieces are made in the 4-cavity finisher before re-sinking. During this forging operation, the tools and work are mist lubricated with a 30 to 1 mixture of water and soluble oil.

Lubricant to suit each job

Each forging setup is provided the coolant and lubricant best suited for the particular job. In forging and piercing couplings, Graflo-103, diluted 6 to 1 with water, is automatically applied by air pressure through a ring of holes in the punch holders. On alternate strokes, water is blown on the tools to cool them—through the same hoses and paths of delivery used for the lubricant.

Hamicote Special NL, diluted 15 to 1 with water, is employed in the slip yoke upsetting machine, and Montgomery No. 10 is swabbed on the weld yokes by hand.



Forgings are taken for a ride on conveyors to and from trim presses. Weld yokes come up from left and are pre-positioned for operators at presses. Then they go through the die and are conveyed up and over to furnace at left

Watch hairspring is installed in a space no wider than ⅛ in. Microscope with light shield has a scribed reticle that shows the operator where to locate 12 spring coils

Microscopes replace loupes for watch assembly

Style dictates smaller and thinner watches, and some are now about as big around as a dime. Jewelers' loupes are too clumsy when the tiny parts for these watches are assembled. So Elgin National Watch Co, Elgin, Ill, has installed Gaertner assembly microscopes . . .

Escapement and balance assemblies are being completed 65% faster at Elgin now that precision microscopes replace old - fashioned jewelers' loupes. These microscopes are mounted on standard table supports, so the work is at a comfortable level and the operators no longer have to bend over with their eyes two or three inches from the assemblies. Results are obvious — assemblies have jumped from 45 to 70 per hour, and accuracy has also improved.

Watches are simply getting too small for ordinary magnifications. Although the escape wheel, pallet and fork, hairspring, and balance wheel for the escapement and balance assembly can all be fabricated in automatic machinery, the parts must be assembled by hand. The parts are much too small to be controlled by observation with an unaided eye, although human sense of touch is still delicate enough to control movement with tweezers.

The microscope for hairspring assembly includes a scribed reticle that shows how the coiled hairspring is to be installed on the balance wheel. The spring is only 0.0008 in. thick, has 12 coils, and must fit into a space about ⅛ in. in diameter—and both ends must be anchored properly. The microscope eyepiece erects the image so an operator can compare the work to the scribed pattern.

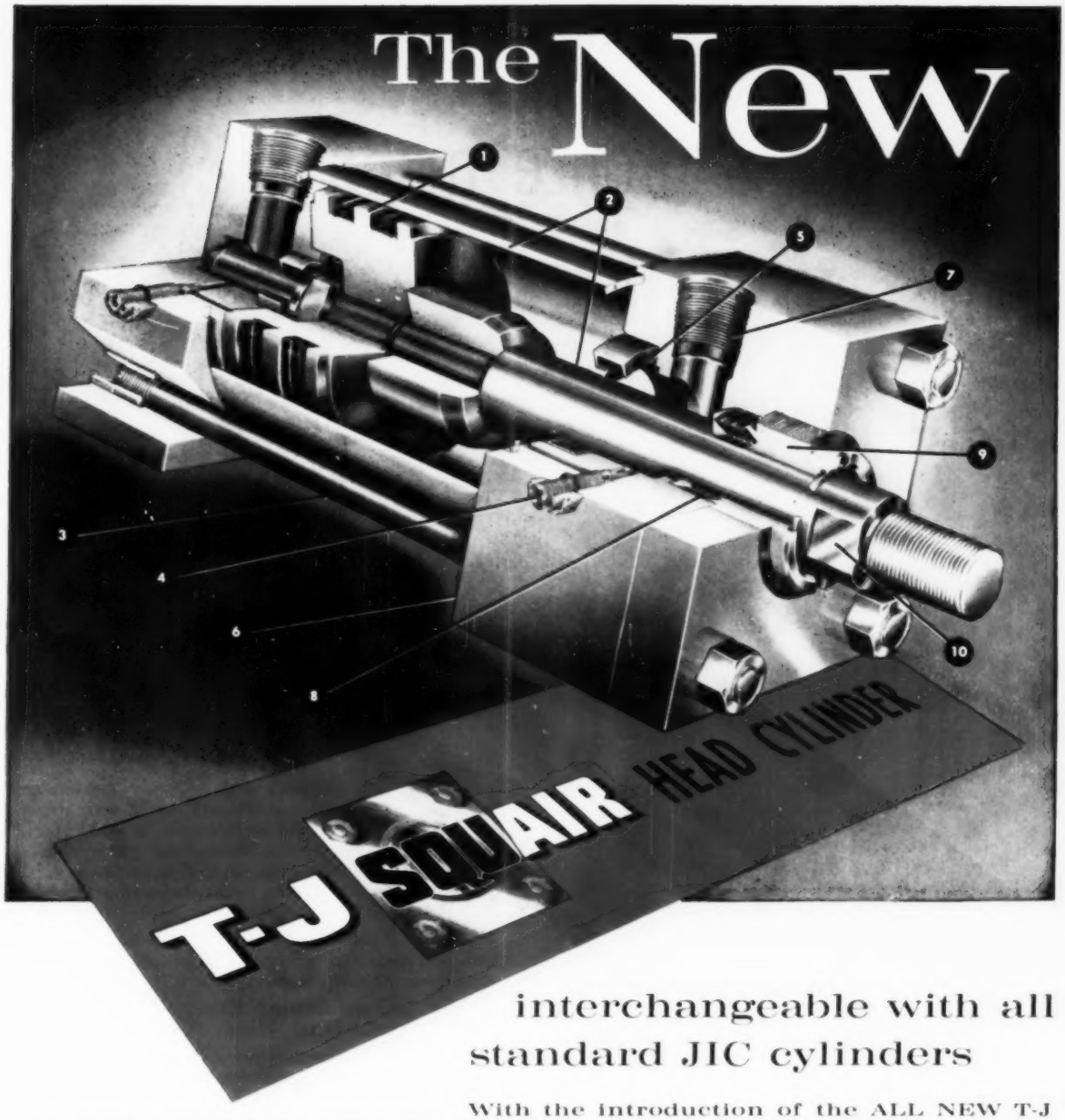
Advantages of the microscope over conventional optical loupes include better assembly. The hairsprings now lie flatter and are positioned more perfectly, and there is less spring twist during final adjustment.

Elgin Electronics Division also employs microscopes, particularly for welding contacts onto Advance Neomite relays that are little more than ½ in. high. Microscopes have allowed doubling relay production because they make the relays, contacts, and adjustment shims more visible.

Gaertner toolmaker's microscopes are applied for inspection jobs, making accurate measurements to 0.0001 in. over a 4 x2-in. range, and angular measurements around 360° to an accuracy of one minute of arc.

Escapement and balance wheels are assembled at a battery of Gaertner microscopes. Watch movements are held in dial plates, and are checked to 0.0001 in. for alignment

The New



interchangeable with all standard JIC cylinders

CHECK THESE 10 POINTS OF T-J SUPERIORITY

1 One Piece Piston

2 Hard Chrome Cylinder Bore and Piston Rods

3 High Tensile Steel Tie-Rods

4 Cushion Adjusting Screw, Externally Adjustable

5 New Super-Cushion for air, or Self-Aligning Master Seal for Oil (T-J Patents)

6 Solid Steel Heads and Mounting Plates Standard all Models

7 Port Design Allows Minimum Pressure Drop on Inlet or Outlet

8 Chevron Type, Self-Adjusting Rod Packing

9 Piloted Packing Gland – Absolute Alignment

10 Piston Rod, Extra Strong – Polished and Chrome Plated for Efficiency and Protection

With the introduction of the ALL NEW T-J Squair Head, Tomkins-Johnson now offers industry the most complete design range of air and hydraulic cylinders. Presently available in bore diameters from 1½ to 8 inches, the T-J Squair Head is an interchangeable cylinder which produces maximum force and efficiency, with minimum pressures . . . and is also adaptable to the use of low pressure oil as the working medium. Write to The Tomkins-Johnson Co., Jackson, Michigan, for Bulletin #SQ 10-58 and complete details.

T-J TOMKINS-JOHNSON

If you have a tough application for a bronze metal Johnson's ALUMINUM BRONZE bars are the answer

Quality **Johnson Aluminum Bronze Bars** are ideal for giving trouble-free performance in such applications as gears, worms and worm wheels, valve seats and guides, hydraulic valve parts, plungers, pump rods, guide pin bushings, special bearings and many others.

Compact grain structure and the unusual alloy in these bars result in high physical properties that increase service life and cut down-time to the minimum.

Resistance to wear and fatigue? Exceptional. Inclusions, porosity, undersurface defects? None.

Johnson's quality solid aluminum bronze bars are supplied with extruded finish. Centrifugally cast tubular bars are semi-finished and machined on the ID and OD. *Both* bars are supplied in standard 12½-inch lengths and in 97 sizes up to 8-inch OD. This allows for saw cut, in equal divisible lengths, with almost no loss in metal.

All 97 sizes regularly carried in stock for both solid and tubular bars assures immediate delivery. Write for catalog. Or, better yet, contact your Johnson distributor. He will be happy to provide more information and quick service.

Johnson Bronze

515 South Mill Street • New Castle, Pa.

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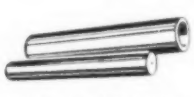
JOHNSON Bearings

GRAPHITED
over 175 sizes

STANDARD STOCK
over 900 sizes



UNIVERSAL BRONZE BARS
over 400 sizes

POWDER METALLURGY
over 400 sizes

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over 350 sizes

American Machinist

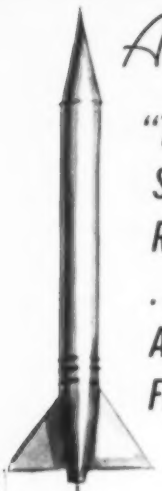
REFERENCE BOOK SHEET

Blank Diameters for Round Shells – I

By Ferenc Kuchta, mechanical engineer, J Wiss & Sons Co, Newark, N J

Workpiece	Blank diameter D	Workpiece	Blank diameter D
1	$\sqrt{d^2+4dh}$	7	$\sqrt{d_4^2+4(d_1h_1+d_2h_2+d_3h_3+d_4h_4)}$
2	$\sqrt{d_2^2+4d_1h}$	8	$\sqrt{3d_2^2-2d_1^2+4d_1h_1+4d_2h_2}$
3	$\sqrt{d_2^2+4(d_1h_1+d_2h_2)}$	9	$\sqrt{d_1^2+4d_1h_1+2f(d_1+d_2)}$
4	$\sqrt{d_3^2+4(d_1h_1+d_2h_2)}$	10	$\sqrt{d_1^2+4(d_xf+d_1h)}$ $d_x=\frac{d_1+d_2}{2}$
5	$\sqrt{d_3^2+4(d_1h_1+d_2h_2+d_3h_3)}$	11	$\sqrt{d_1^2+4(d_xf+d_1h_1+d_2h_2)}$ $d_x=\frac{d_1+d_2}{2}$
6	$\sqrt{d_4^2+4(d_1h_1+d_2h_2+d_3h_3)}$	12	$\sqrt{d_2^2+4(d_1h_2+d_2h_1)+2f(d_2+d_3)}$

Another **KING** "Defense Production Special"

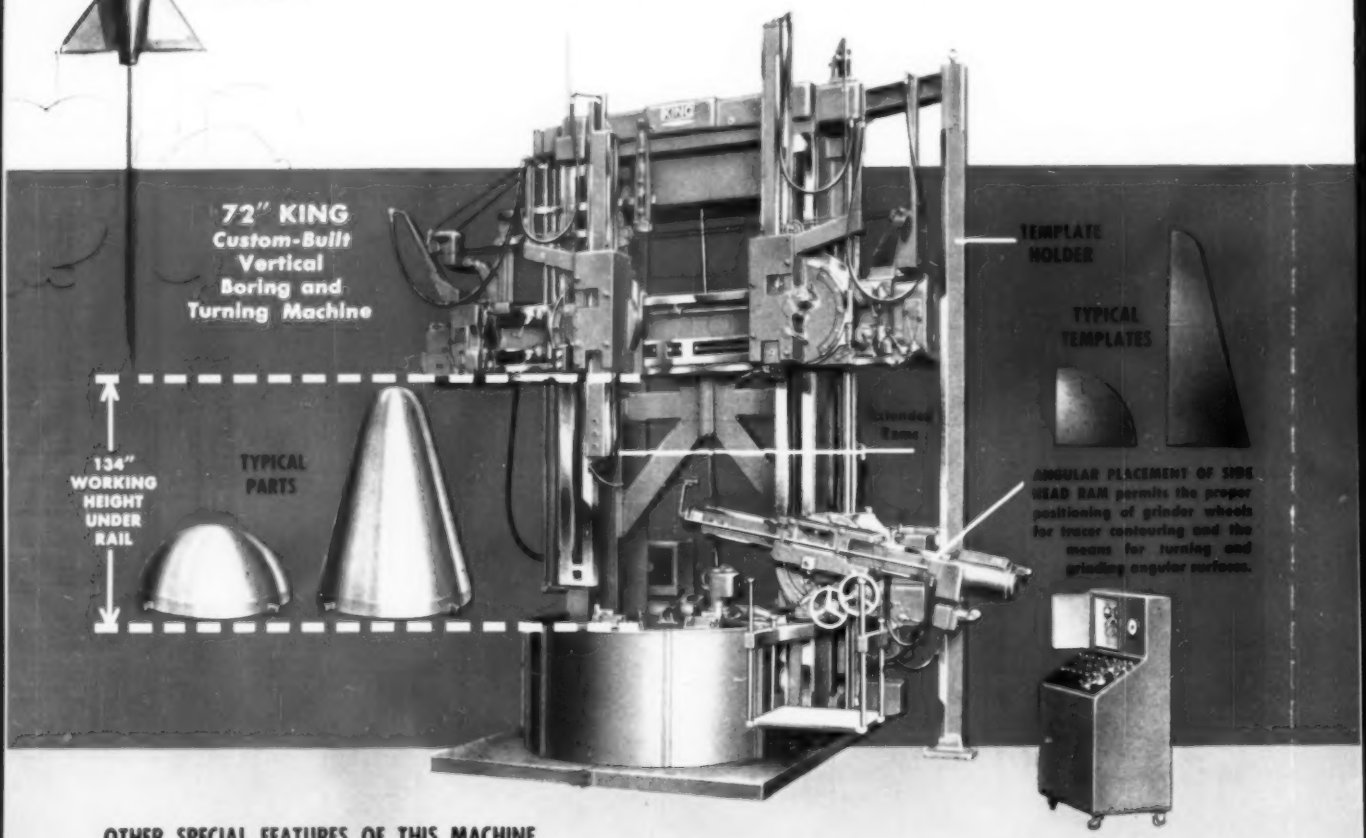


"Tailor-Made" to Specific MISSILE Requirements ... Yet Retaining All General-Duty Features

Recently installed in one of the nation's leading aircraft plants, this specially-built unit is a good example of the wide range of design versatility which is available in KING® Vertical Boring and Turning Machines.

When you buy a custom-designed KING machine, you buy only the accessory equipment, electrical controls, and design modification which your special-work machining operation requires—*no more and no less!* And always, you have in the basic machine all the standard facilities for general-purpose boring, facing, and turning.

This KING combination of special features and general-purpose facilities makes *all the difference* in competitive cost-control.


72" KING
Custom-Built
Vertical
Boring and
Turning Machine
TEMPLATE HOLDER
TYPICAL TEMPLATES
134" WORKING HEIGHT UNDER RAIL
TYPICAL PARTS
ANGULAR PLACEMENT OF SIDE HEAD RAM permits the proper positioning of grinder wheels for tracer contouring and the means for turning and grinding angular surfaces.

OTHER SPECIAL FEATURES OF THIS MACHINE

Swiveling type side head arranged for tracer controlled turning and grinding operations.

Grinding attachment with multi-speed precision motorized spindle extending through side head ram and arranged to receive interchangeable quills. Attachment includes balancing type wheel holders and wheel guard with exhaust outlet.

3-position tool holder for side head, which can be readily interchanged with grinder quills for turning operations.

Operator carrier platform attached to side head,

Console control system.

Electronic, two-dimensional (360°) tracer mounted on side head. Template holder arranged to support templates of the type required for work pieces utilizing full capacity of the machine. Universal adjustment is provided for the tracer head.

Electronic, two-dimensional (360°) tracer mounted on rail head. Template holder mounted on top of rail to provide maximum work clearance above table. Positioning controls for stylus head for operator convenience.

Constant surface cutting speed attachment and constant chip thickness controls applied to both tracer heads.

Coolant conducted through rail head rams.

For further details on KING machines—standard 30" to 144" designs or special custom-built units—see your authorized KING Distributor, or write to us direct.

AMERICAN STEEL FOUNDRIES, KING MACHINE TOOL DIVISION
1150 TENNESSEE AVENUE, CINCINNATI 29, OHIO

KING Vertical Boring and Turning Machines

Blank Diameters for Round Shells – II

Workpiece	Blank diameter D	Workpiece	Blank diameter D
13	$\sqrt{d_2^2+4(d_1h_2+d_2h_1+d_xf)}$ $d_x=\frac{d_2+d_3}{2}$	19	$\sqrt{d_1^2+4d_xf}$
14	$\sqrt{d_3^2+4(d_1h_1+d_2h_2)+2f(d_4+d_3)}$	20	$\sqrt{d_1^2+2f(d_1+d_2)+d_3^2-d_2^2}$
15	$\sqrt{d_2^2+4(d_2h_2+d_xf+d_1h_1)}$ $d_x=\frac{d_1+d_2}{2}$	21	$\sqrt{d_1^2+4d_xf+d_3^2-d_2^2}$
16	$\sqrt{3(d_2^2-d_1^2)+4d_1(h_3+\frac{f}{2})+4d_2h_2}$	22	$\sqrt{d_1^2+2\left[f(d_1+d_2)+2d_2h\right]}$
17	$\sqrt{d_2^2-d_1^2+4d_1(h_2+\frac{f}{2})}$	23	$\sqrt{d_1^2+4(d_xf+d_2h)}$
18	$\sqrt{d_1^2+2f(d_1+d_2)}$	24	$\sqrt{d_1^2+4(d_xf+d_2h)+d_3^2-d_2^2}$

◄ CIRCLE 272 READER SERVICE CARD

Photograph courtesy Ohio Seamless Tube Division of Copperweld Steel Company

Aristoloy uniform quality steel bars pay off on hot piercing operations

Few manufacturing operations match piercing of tube rounds as a severe test of quality. Rapid displacement of metal and immediate increase in temperature reveal internal defects . . . magnify the slightest surface imperfections.

Copperweld's precise melting produces a prime ingot of uniform chemistry. Careful conditioning and rolling deliver bars that meet Aristoloy piercing quality specifications. Available in a full range of A.I.S.I. standard analyses.

For complete information about Aristoloy blooms, slabs, billets and bars, in carbon, alloy, stainless and leaded, call Copperweld in your nearest large city, or write for NEW PRODUCTS & FACILITIES CATALOG.

ARISTOLOY STEELS

COPPERWELD STEEL COMPANY

ARISTOLOY STEEL DIVISION • 4009 Mahoning Ave., Warren, Ohio • EXPORT: Copperweld Steel International Co., 225 Broadway, New York 7, N. Y.

Blank Diameters for Round Shells – III

Workpiece	Blank diameter D	Workpiece	Blank diameter D
25	$\sqrt{d_1^2+2\left[f_1(d_1+d_2)+f_2(d_2+d_3)\right]}$	31	$\sqrt{2d_1^2}$ $1.414d_1$, $\sqrt{2d_1^2+(d_2^2-d_1^2)}$ $\sqrt{d_1^2+d_2^2}$
26	$\sqrt{\dfrac{2\left[d_1f_1+f_2(d_2+d_1)+2(d_1h_2+d_2h_4+d_3h_5)\right]+d_5^2-d_4^2}{}}$	32	$\sqrt{d^2+4(h_1^2+dh_2)}$
27	$\sqrt{d_1^2-d_2^2+d_3^2+4(d_1h_1+d_2h_3)+2f(d_2+d_1)}$	33	$\sqrt{d_1^2+d_2^2+4d_1h}$
28	$\sqrt{\dfrac{2\left[d_1f_1+f_2(d_1+d_2)+2(d_1h_1+d_2h_4)\right]+d_3^2-d_2^2}{}}$	34	$\sqrt{d_2^2+4(h_1^2+d_1h_2)}$
29	$\sqrt{2d^2}=d\sqrt{2}=1.414d$	35	$\sqrt{d_1^2+d_2^2+4d_1h}$
30	$\sqrt{d_1^2+d_2^2}$	36	$\sqrt{2d_1^2+4d_1h}$ $\sqrt{2d_1^2+4d_1h+(d_2^2-d_1^2)}$ $\sqrt{d_1^2+d_2^2+4d_1h}$

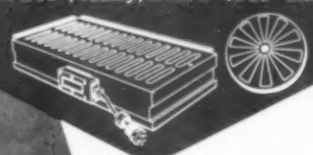
World's largest, most complete line of permanent and electro-magnetic and vacuum chucks

Walker Chucks are designed and engineered to give efficient and completely dependable performance in all applications. The incomparable combination of structural and operating features makes Walker Chucks your best buy in every way.

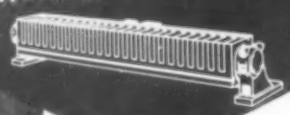
Walker permanent magnetic chucks utilize ceramic magnets which have *three times* the coercive force of alloy magnets. Rectangular chucks are available in 6 stock sizes, 6 x 10" to 12 x 24"; rotary, from 4" to 60" dia.

Small, thin work is easily handled with Walker bar pole electro-magnetic chucks. Rectangular in 81 sizes, from 6 x 12" to 30 x 96".

Holding jigs and fixtures are eliminated when you use Walker electro-magnetic chucks. Rectangular in 72 stock sizes, from 4 x 8" to 30 x 96"; rotary, from 6" to 36" dia.



In addition to the extensive range of stock sizes of permanent, electro-magnetic, and vacuum chucks and holding fixtures, Walker is your best source for "specials" for specific applications.

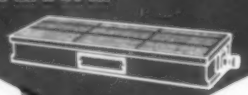


Walker has long been the leader in the field of demagnetizers. Stationary, hollow core demagnetizers are made to order in any size and shape of gap from 1" square up.

For complete information on the entire Walker line, write for Catalog No. 58.

O. S. WALKER COMPANY, INC.
WORCESTER 6, MASSACHUSETTS, U. S. A.

Walker vacuum chucks for holding non-ferrous parts are made to order in any desired size and shape. Favorites in the aircraft industry, they solve the problem of holding non-ferrous sheet stock. From 4" dia. to 10 ft. x 24 ft.



O. S. Walker

O. S. Walker—The Original Designers and Builders of Magnetic Chucks!

Talking Shop...

Double Duty

WE WERE in a plant recently that needs a fire watchman at night. Instead of walking, he makes his rounds riding on a power sweeper. By morning the plant has not only been watched, it has been swept. We inevitably thought of the famous story (probably apocryphal) about Henry Ford and the workman who wasn't doing enough. Ford kept finding additional tasks for the other hand, and then the legs, finally tied a broom to the man's seat so he could sweep while he worked. It is perhaps characteristic of our changing times that what was once a rather vicious joke has become reality—and increased the comfort of the workman in the process.

Filtered Savings

AN EXAMPLE of the savings possible with central filtration systems is cited by Charles Wallace of U S Hoffman. In a plant with 54 belt grinders the saving is amounting to more than $124,000 per year. It breaks down like this:

Reduction in ball bearing replacement	$15,000
Reduction in drive wheel replacement	52,500
Reduction in contact-wheel replacement	36,864
Oil salvaged by filtering	17,617
Labor	2,566

We've seen some pretty fancy central systems and we've seen some practical single machine installations. In both cases, we've rarely encountered a production man using filtration who didn't swear by it. What surprises us is the number of plants that still don't use any coolant filtration at all.

Trouble Shooting Approach

WHAT DO YOU do when you are having a tool life or finish problem on a cutting operation? Here's what Giddings & Lewis does:

First, check the tool setup for rigidity or serious error.

Second, check the metal for variations in hardness.

Third, check the coolant.

These three checks have been found to solve most of the problems without going into more expensive checks on tool design or investigating the need for modifying the process.

An example is a problem G&L had on poor cutter life in milling a circular pitch worm screw part—only one or two parts per cutter grind. The cutter was a high-speed-steel, 18-tooth thread mill with a staggered 4-in. dia and a side clearance of 7°. The part was a 3-in.-dia shaft on which a ½-in. circular pitch worm screw was milled to a depth of 0.343 in. for a total length of 3.5 in. Cutter was 4-in. dia and ran 113 rpm with a feed of 5.63 ipm. The work was Nitralloy 135 with the heat treatment modified to 28 to 38 R_c.

No fault could be found with the tool setup. No hard spots in the work. To check the cutting oil they added a trouble-shooting compound to the regular oil. There are various such compounds available. G&L used Van Straaten's Vantrol 5510-Z—a base lubricant with six additives to provide extreme pressure lubricating characteristics. With one gallon of this compound added to every five gallons of the regular cutting oil, tool life went up to 15 pieces per cutter grind.

Such trouble shooter compounds can be used to add to existing compounds, used straight where chip welding problems occur, or to seek information on which of a series of other compounds give longer runs.

Hard-nosed Die

FIVE-TIMES THE LIFE of the forging die it replaced is reported by Haynes Stellite for a hard-faced die. The cavity was formed, then faced with Haynes Stellite No. 6 cobalt-base alloy. The finished impression was then cut on an Elox electrical-discharge machine. The entire job took 40 hours, but did not require either skilled die sinkers or expensive bench time for hand finishing.

MEMOS

by BESS RITTER

"Clink" (meaning a prison) dates back to the late 1300's when it was a slang expression which described the noise made by rattling iron chains. It was used almost solely by English farm workers and blacksmiths.

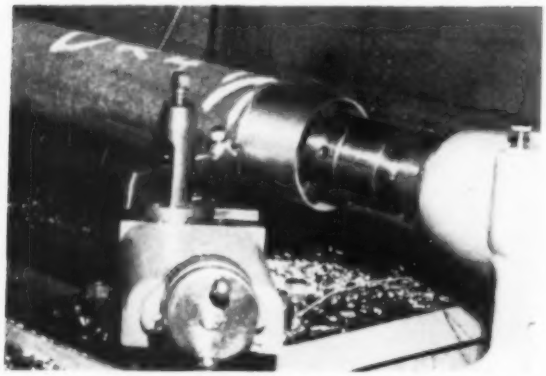
Shortly afterwards, however, the authorities here adapted special chains for use in Southwark Prison, near London Bridge, and since this location was such a central one, passers-by who easily heard the "clink," eventually called Southwark Prison "the Clink" as well.

"To fly off the handle," (meaning to show sudden explosive anger) dates back to the early American pioneers who imported axe heads from the east, and hewed their own handles for them from local wood. Since such tools (very naturally) weren't very safe, it was more commonplace than not for the business section of the axe to "fly off the handle" when it was being used.

Naturally, this led to a show of real rage, and although this tool was eventually replaced through the years with a much more reliable type, it is still commemorated in the expression which it unfortunately originated.

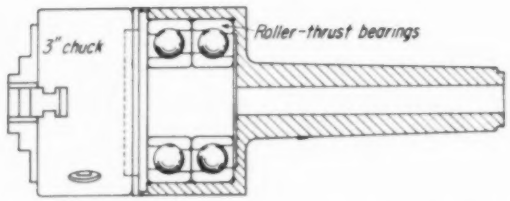
Practical Ideas...

Live Tailstock Chuck Supports Large-Diameter Work



This live chuck works on the same principle as a live center used in the tailstock of a lathe. Its adaptation was primarily designed to support the free end of large-diameter tubes which were being machined in the production of gun blast tubes.

The three-jaw chuck, when opened inside the tube, automatically centers and supports the work, thus eliminating the use of spiders or plugs. And, as the spindle chuck also grips the work from the inside, the entire length of the OD can be turned without interruption.



In addition, the line chuck provides enough clearance to end face the tube in the same set up.

Since the fixture was made, it has performed identical functions on such work as recutting commutators on armatures that had no centers. It has also been used to grip rough bar stock for spot cutting where a steady-rest had to support the stock.

The assembly consists of a 3-in. 3-jaw chuck which is affixed to a shanked adapter. The shank of this adapter is press fitted into the inner races of two ball-thrust bearings which are in turn pressed into a holder housing. This holder has a shank tapered to suit the tailstock of the machine; and the hole through the shank is designed to simplify removal of the adapter when repairs or replacement of bearings are necessary.

John Dudonis, tooling-shop foreman, Grumman Aircraft Engineering Corp, Bethpage, LI

Live Stop for Automatics

An efficient live stock stop can be made economically as shown in the illustration. The ball-bearing thrust pad used on the stop is a spare back-up pad from a popular make of metal-cutting bandsaw.

These pads are ball - bearing mounted and have a smooth hardened steel-front face for wear resistance. Their integral shanks are the proper diameter for a mild force fit in a ¼-in. reamed hole.

The thrust pad is mounted in a mild-steel shank which seats in a turret station in the same manner as a conventional stop. In use it is effective in preventing rub marks on the finished end it contacts.

H J Gerber, Stillwater, Okla

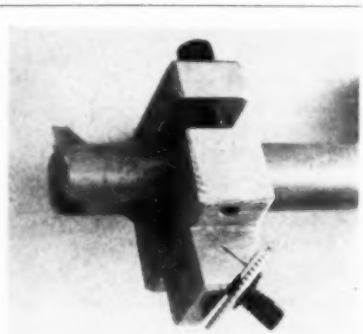
Tool Adjustment for Boring Bar

The biggest problem when using a solid boring bar in a miller or boring mill is that of adjusting the toolbit to cut accurate diameters. When the boring bar is heavy enough, the toolbit hole may be tapped to accept a setscrew behind the toolbit. But, though this method is more definite than jarring the toolbit with a hammer, it still leaves much to be desired.

A fixture that takes a lot of the guesswork out of this operation is shown in the photo. It can replace the setscrew-in-toolhole method as well as it can be used on smaller bars. It is essentially an aluminum V-block which has a tapped hole at 45°, and two tapped holes for a pair of strap screws.

The block, when fitted with a long ¼-20 square-headed setscrew, is clamped on the bar while tool adjustments are made. Adjustments completed, the strap is loosened and the block rotated a quarter turn and slipped off the front end of the bar over the tool.

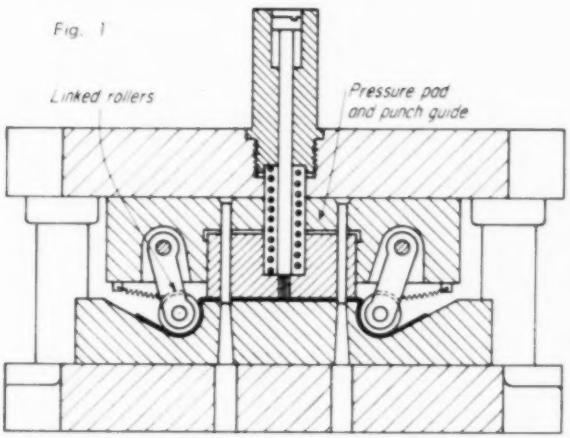
Minute tool changes are made possible with the friction-mounted dial on the screw. Because each revolution of the screw represents 0.050 in. of motion, the dial can be marked with 50 divisions. Or, if this many lines seems to crowd the dial, 25 divisions, each line representing 0.002 in., may be easier to read.

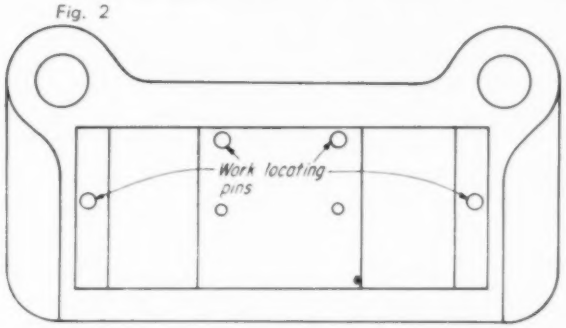


When adjustments have to be made, the block is clamped on the bar so that the setscrew is in direct line with the toolbit. The screw is then made to contact the tool, the dial is zeroed out and, if an increase has to be made, the tool is loosened and the screw turned clockwise the desired amount, after which the tool is again tightened.

Robert J Lemp, Sayville, NY

Roller-Forming Die Performs Difficult Undercut Bends





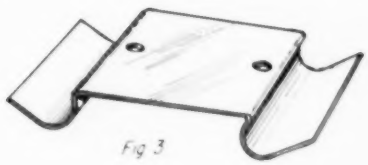


Fig. 3

The die shown was designed to form and pierce a part, Fig 3, with a single stroke of the press. However simple in appearance, the part's side bends did present one problem which excluded a standard bending or drawing die. Each end had to be formed into an undercut ending in an upward bend.

Our solution was to employ linked rollers in the punch half that, on the down stroke of the press, would cam inward to fold the blank into die undercuts. The camming action takes place when the rollers depress the blank ends against the inclined faces of the die. This design not only filled the forming requirements, but it did so without creating stress in the material.

During the final part of the downward ram movement, almost at the bottom dead center, two punches pierce the blank. These punches operate through a stripper which also acts as pressure pad to hold the blank before and during the forming operation.

On the press-ram upstroke, the rollers return to open position aided by springs and limited in motion to the reliefs milled in the punch holder, see Fig 1. The slight springback in the part piece allows it to be slipped forward off the die. Fig 2 shows top view of die with its four work-locating pins.

Hjalmar Dahl, Upplands Vasby, Sweden

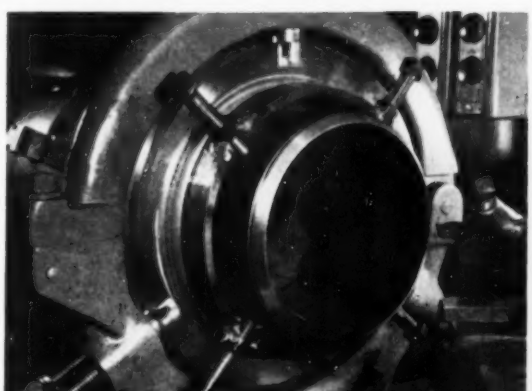
Ball-Bearing Steadyrest Provides Frictionless Support

We often have to turn large-diameter pipes, tubes and other rough stock in the lathe. Much of this work calls for machining multiple diameters which have to be concentric to each other; that's where problems enter into the picture.

Not only are the surfaces too rough for precision turning when the work is supported in a standard steadyrest, but there is also a great amount of wear on the steadyrest jaws. These difficulties are present even when lubricating compounds are repeatedly added which, inevitably, results in a messy job.

A solution to the problem was found in the steadyrest adapter shown in the photo. Here a narrow-width ball bearing is employed to smooth the bumps and keep the work and machine clean. Because this was a prototype, the outer shell, housing the bearing, was made of Plexiglass to simplify machining without sacrifice of the necessary strength. Three holes were drilled to accommodate the ends of the steadyrest adjusting screws.

A sleeve cut from a large-diameter pipe was mounted into the inner race of the bearing. Four ½-in. 20 hex nuts were welded into equally spaced notches cut

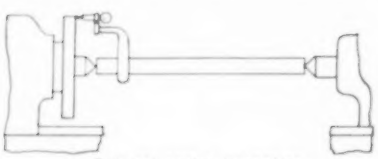


in the protruding edge of the sleeve to accommodate four ½-in. 20 screws. By adjusting these screws, rough workpieces can be held concentric and, with the aid of an indicator, second operations can be quickly set up.

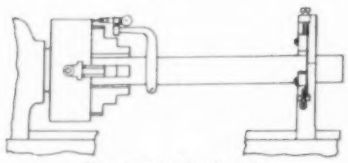
John McCafferty, Patchogue, NY

Practical Ideas...

Inspection Methods Give True Position of Tailstock Center and Steadyrest



Tailstock-center inspection



Steadyrest adjustment

When a workpiece has to be turned on centers, it's important to know in what relation the tailstock center is to the headstock spindle. The methods by which this factor may be checked are many and varied. Some are good; others are crude and expensive.

The process illustrated is the one I like best for several reasons. First, the horizontal position of the tailstock center is quickly found, and secondly, its height, or vertical position, can be checked at the same time. Third, the center can be accurately positioned for taper turning, and fourth, the adjustment of steadyrest jaws is also simplified.

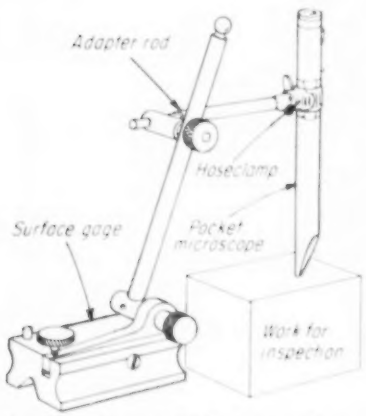
Inspection is carried out as follows: A mandrel or a piece of round stock, (preferably of the same length as the work to be machined) having a good center hole at each end is mounted between the centers. An indicator is then fastened to the mandrel in such a way that the contact ball of the indicator touches the faceplate near its edge.

If the accuracy of the faceplate can be relied upon, a check is made by simply rotating the arbor to describe a full circle with the indicator. This will reveal both vertical and horizontal positions of the tailstock center. Rotating the faceplate and the mandrel in unison eliminates errors caused by irregularities in the faceplate.

By using a mandrel of a specific length, the tailstock center can be accurately moved over for simplified taper turning. The indicator should then contact the faceplate on its horizontal axis, either toward or away from the operator.

When adjusting the steadyrest jaws, the indicator clamp is mounted directly on the workpiece. While the work is lightly gripped in the chuck, the indicator should touch the chuck face as the chuck and work are rotated by hand. Any deviation from a steady indicator reading is corrected by adjusting the steadyrest jaws.

Paul Kagan, Denver, Colorado



Surface Gage Aids Inspection

When a pen microscope or pocket comparator is properly supported, it is more useful and easier to apply in inspection work. When hand held, these tools are difficult to focus or otherwise manipulate.

The method we employ in supporting either tool is simple; we just mount them on a surface gage. The only fabrication necessary is a clamping arrangement which the surface gage supports. Fine focusing adjustments are made with the adjusting screw which is already an integral part of the gage.

The clamping adapter is put together from a small hose clamp and a mounting rod. One end of the rod is turned down to fit the surface-gage clamp while the other end is brazed to the hose clamp. A piece of tape is placed under the clamp before tightening to prevent damage to the microscope or comparator.

R B Courtney, Whittier, Calif

K Haller
Millington, NJ

$25 In addition to regular payment for his idea:

LATHE FIXTURE STRAIGHTENS WIRE

in the April 6, 1959 issue

An extra $25 will be paid for the best Practical Idea in each issue of *American Machinist*. Selection of the winner is made by a group of our readers.

PAYMENT—$25 in addition to regular rates for the items published to be paid as soon as reader votes are received—usually three to four weeks after the date of issue. The winner will also be announced in these pages as soon thereafter as practicable.

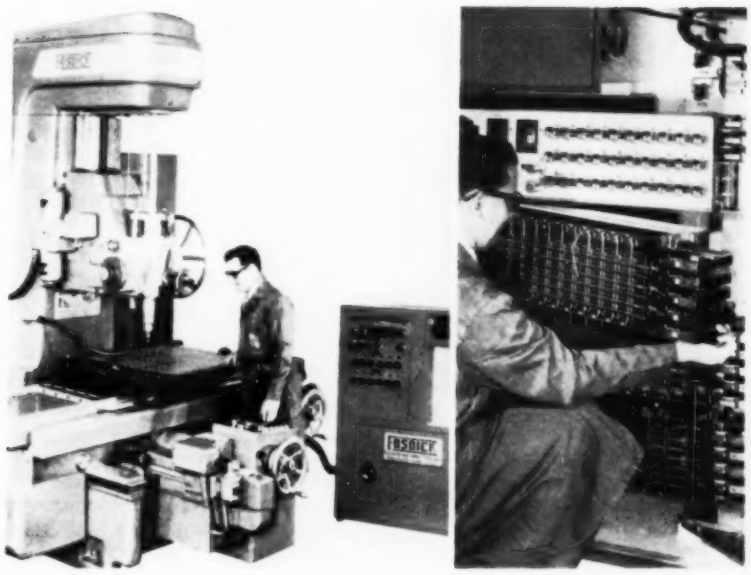
JUDGES—A group of 200 *American Machinist* readers in asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in a tie, $25 will be paid to each co-winner. Decision of the readers will be final in each case.

REQUIREMENTS—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer, or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

WHO MAY ENTER — Anyone may enter except employees of the McGraw-Hill Publishing Co, Inc, and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER — Send all entries to "Practical Ideas Editor," American Machinist, 330 West 42nd St, New York 36, N.Y.

New Shop Equipment
Materials and Parts



Telephone-Type Cross-Bar Switches Used As Memory System for Numerical Control

Cross-bar switches, familiar components of automatic telephone systems, are used as electromechanical memory units in Fosdick's numerical control to provide dependability, compactness, and ease of maintenance exceeding that of electronic units, according to the manufacturer. The numerical control is designed for use with Fosdick jig borers and jig grinders, models 44 and 45.

As its name implies, the cross-bar switch is a grating of crossed bars, actuated by electromagnets. Bars in the X-axis feed information into the switch; bars in the Y-axis pick it up, hold it, and release it when needed.

Measuring 23 x 9 x 6 in., each switch contains 10 columns of 10 contacts—100 "pockets" to store digital information. Two switches store information to control spindle feeds and speeds and two axes of table movement; a third handles spindle depth control and tool designations; a fourth, automatic tool changing.

Fosdick Machine Tool Co., Cincinnati, Ohio

MORE DATA? Circle 51, inside back cover

New Bendable Aluminum Alloy Developed by Asarco

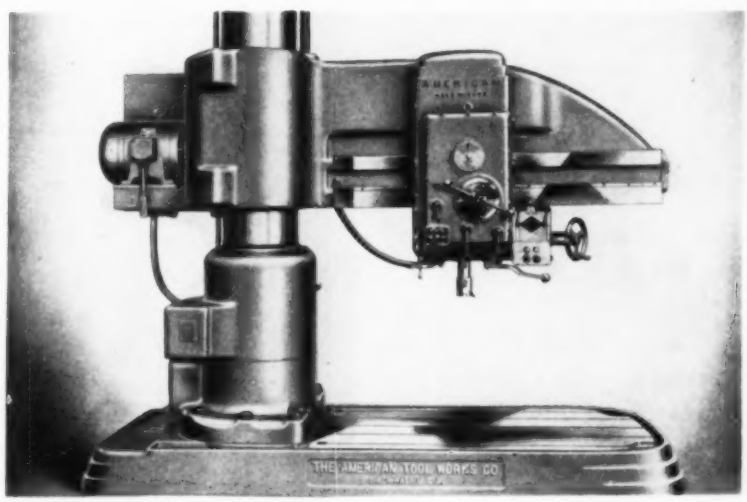
Properties of Adaptaloy include exceptionally high elongation and impact strength and ability to sustain bending and deformation. No special treatment of any kind is required during casting, and any mold medium may be used. At present, the alloy is not recommended for die casting.

In tensile strength, yield strength, and hardness, the characteristics are of the same order as 43 alloy and Asarco's F 050. Mechanical properties are: tensile strength, psi, 22,000-25,000; yield strength, psi, 8,000-10,000; elongation percent, 7-11; hardness BHN, 48; charpy impact strength (ft lbs) notched, 4-5, unnotched, 15-20.

Material is specifically formulated for applications such as the manufacture of structural castings designed to operate under a specific load and to deform when overloaded.

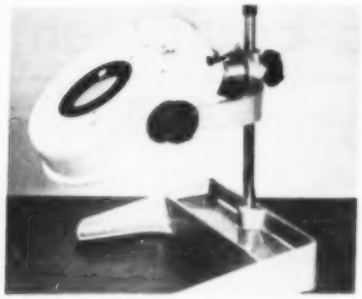
American Smelting & Refining Co, Federated Metals Div, 120 Broadway, New York 5, NY

MORE DATA? Circle 52, inside back cover



THIS 19-IN. COLUMN RADIAL DRILL, available with 6, 7, or 8-ft arms, is the newest addition to American's Hole Wizard line. Drill is designed to transmit full overload capacity of 30 hp motors. Other features are boring mill type spindles of nitrided nitralloy steel and a 40% speed-up of the spindle on reverse for tapping operations—*American Tool Works Co, Pearl St, Cincinnati 2, Ohio*

MORE DATA Circle 53, inside back cover



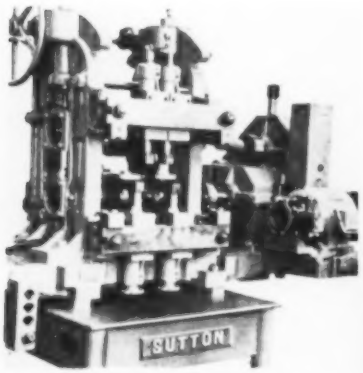
Magnifier-Viewer Uses Multiple Lens Achromatic Optical System

PowerScope is a magnifier-viewer using a multi-lens achromatic optical system that is reported to provide a distortionless, true-color view for machining operations, assembling, inspection, and lab activities.

It has a precision ground, highly color corrected and cemented 5 in. achromatic lens system that provides a 2X magnification. Magnification can be increased to 3X by adding another lens cell which bayonet-mounts on the basic lens system. Field of view is 14 in. dia with the 2X lens, 6 in. dia with the 3X lens. Shadowless illumination is provided by a 22-watt fluorescent lamp in the steel lens housing.

Edmalite Optical Co, Inc, Peekskill, NY

MORE DATA? Circle 54, inside back cover



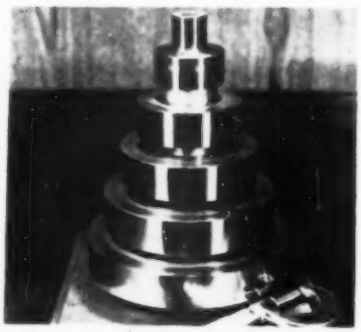
Machine Corrects Aluminum Cross-Sectional Distortion

Sutton Contour Correcting Machine corrects cross-sectional distortions of aluminum extrusions to close tolerances. It can handle flat sections up to 14-in. wide, and can make multiple corrections of shapes within a 9-in. circle in one pass.

Correcting mechanism consists of two main-drive spindles with rolls, which may be used for correcting as well as traction, and up to eight correcting idler rolls, which may be positioned in many different ways on as many as twelve tool holder positions. After initial set-up, tool holders may be adjusted externally, both vertically and horizontally, to apply increased or decreased pressure.

Sutton Engineering Co, First National Bank Bldg, Pittsburgh 22, Penna

MORE DATA? Circle 55, inside back cover

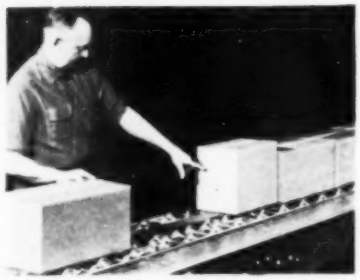


Three New Mikemaster Models Introduced

Three new models of the mikemaster, used to check mikes and other OD tools, are designated M-1, M-1½, and M-2. M-1 is made in 1-in. steps from 1 to 6 in. M-1½ is in steps of ½ in., with a range of ½ to 6½ in. Model M-2 is used to check the 0 to 1-in. range of instruments in steps of 0.100 in.

Size Control Co, 2500 W Washington Blvd, Chicago 12, Ill

MORE DATA? Circle 56, inside back cover

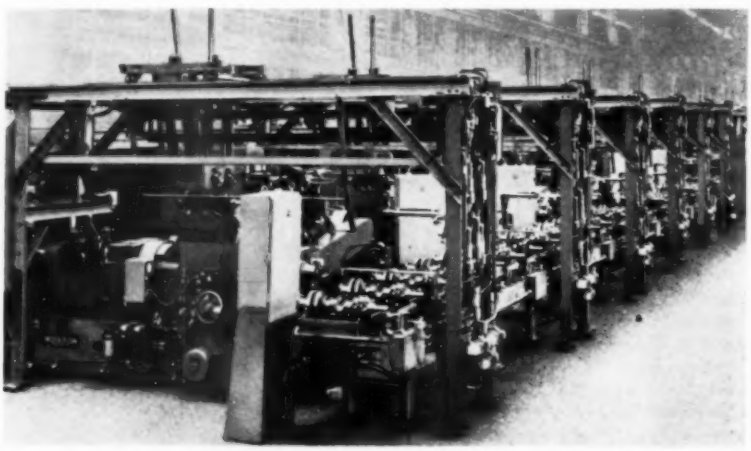


Pressure-Sensing Conveyor Also Has Spacing Control

Pressure-sensing conveyor, consisting of a wheel conveyor with a 4-in. power belt replacing the center load-bearing wheels, is reported to minimize problems of accumulated line pressure.

The A-P-C (adjustable pressure control) conveyor works like this: The weight of the first carton, resting on a trigger wheel, pulls pressure wheels away from the belt so that it loses contact with the following cartons. A series of trigger and pressure wheels repeat this process so that all but the first carton are resting on load-bearing wheels on either side of the belt.

The combined trigger wheel and pressure wheel mechanism also spaces the cartons automatically when the accumulated load is put into motion again. When the stop is removed only the first carton moves forward. After the first carton clears the trigger wheel, the belt comes into contact with the second carton.



SEVEN-STATION CRANKPIN GRINDER, believed to be the largest and most expensive grinding machine ever built, is designed to process 60 automotive type crankshafts an hour. It is 19 ft wide, 90 ft long, and costs approximately $750,000. The Norton No. 2 Unitized Crankpin Grinder (AM—Aug 12, '57, p166) is a completely automatic transfer machine which is controlled from a master control panel (foreground) by a single operator—*Norton Co, Worcester 6, Mass*

MORE DATA? Circle 57, inside back cover

and moves it. This process is repeated for each carton.

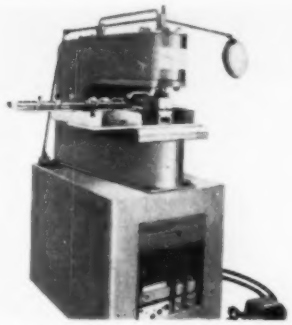
A-P-C conveyor units are available in 5 and 10-ft sections, with minimum conveyor of 15 ft and maximum of 200 ft. Maximum recommended loading is 50 lbs per lineal ft. Standard speed is 65 fpm, with speeds up to 100 fpm available on special order. Conveyor, powered by either 1/3, ½, or ¾-hp motors, can be lowered to 15 in. from the floor.

Rapids-Standard Co. Inc, 342 Rapistan Bldg, Grand Rapids 2, Mich

MORE DATA? Circle 58, inside back cover

NINE RADIAL SPINDLES on this machine drill nine 0.090-in. holes on the periphery of transmission clutch hubs at the rate of 480 parts per hour. A single circular cam controls the feed and return stroke of all spindles—*F Jos Lamb Co, 5663 E Nine Mile Rd, Detroit 34, Mich*

MORE DATA? Circle 59, inside back cover



Air-Hydraulic Unipunch Press Operates at 10 tons Capacity

Model 1012, equipped with precision Unipunch gaging and tooling, is designed for fast, economical hole punching in angles, channels, extrusions, and sheets.

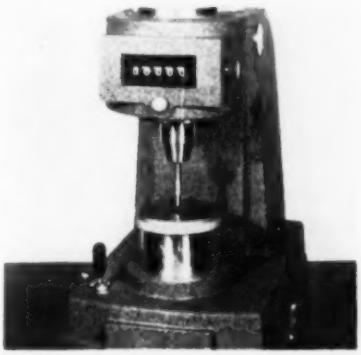
Thirty-seven round punches and 74 dies with four Unipunch hole punching units and one Unipunch notching unit are available with this press. In addition to punching round and shaped holes and notching corners and edges, press may be used for punching extruded and countersunk holes, small louvers, and lanced holes. Small diesets may be installed for making stampings. With a templet, several hole punching units may be set up for making a cluster hole pattern in place of expensive custom punches and dies.

Model B-7020 Uninotch unit is for notching 90° 5 x 5-in. corners in 20-gage mild steel; 3 x 3-in. in 1/6-in.-thick mild steel; or $1\frac{3}{8}$ x $1\frac{3}{8}$-in. in $\frac{1}{8}$-in.-thick mild steel.

Press operates at 10 tons capacity from 65-75 lb airline pressure. Ram adjustment provides for varying daylight openings and permits a wide range of press operations. Positive action from foot control to ram release eliminates double stroking. Throat depth is $15\frac{1}{2}$ in.

Punch Products Corp, 3800 Highland Ave, Niagara Falls, NY

MORE DATA? Circle 61, inside back cover



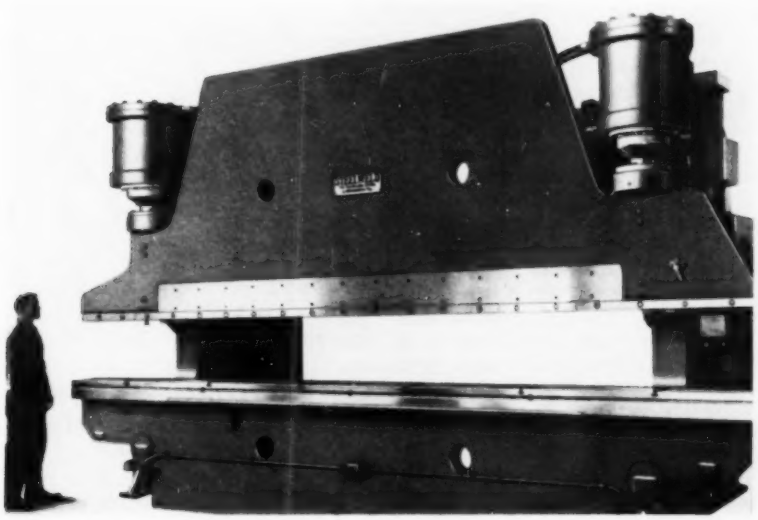
Electronic Micrometer Measures Automatically to 10 Millionths

Model PDC Carson-Dice Electronic Micrometer measures dimensions automatically to 0.000010 in. and displays the dimension in digital form. A true measuring instrument, not a comparator, it displays dimensions without reference to gage blocks or standards. Operator error is said to be eliminated because there are no scales to read, interpolate, or estimate.

Measuring screw has a 1-in. range and anvil height is adjustable over a 2-in. range. Throat depth is 3 in. Standard anvil surface is 3-in. dia. Work pressure with standard tip is zero, but a special tip can be provided with hold-down pressures of 1.5, 5, 10, and 20 grams.

It works like this: Operator places work under micrometer spindle, and moves the lever switch (left of anvil) forward to begin measurement. Motor drives spindle and counter until micrometer touches work. At that instant the electronic control system stops the micrometer and a green light flashes on to indicate the reading is completed. When lever is raised, micrometer screw is automatically reversed to clear the work.

Repeatability of the system is five millionths and repeated readings will vary no more than one digit from the



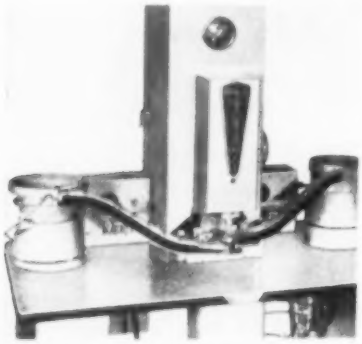
LONGEST PRESS BRAKE in Cleveland Crane and Engineering's Steelweld line, Model LH14-14, will handle mild steel plate up to 20-ft wide by 5/16-in. thick. Ram is driven by two hydraulic cylinders and is kept level by electronic controls. Machine is rated at 500 tons and stroke length is 14 in.—*Cleveland Crane and Engineering Co, Wickliffe, Ohio*

MORE DATA? Circle 60, inside back cover

true value. For the ranges used most frequently on this machine—0.010 in. or less—screw thread error is within the repeatability range.

J W Dice Co, 16 Highwood Ave, Englewood, NJ

MORE DATA? Circle 62, inside back cover



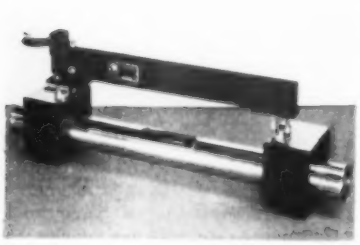
Automatic Machine Inserts Wide Range of Small Parts

An automatic inserting machine called Sertomat is equipped with interchangeable tooling for use on a wide range of parts such as terminals, connectors, pins, studs, and fasteners. Electrical interlocking permits use of the machine in automated set-ups such as multiple-head arrangements, tape or templet control.

Parts are fed into position through chutes from two hoppers and are lightly pressed into place by a cam-operated ram which is adjustable for pressing force, speed, and stroke. Cycle is actuated by a two-position foot switch. Insertion rates may range up to 3000 pieces per hour.

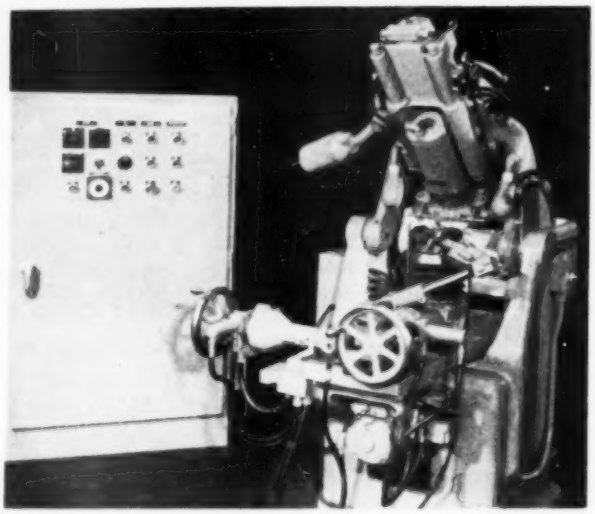
Hill Machine Co, 1501 Eddy Ave, Rockford, Ill

MORE DATA? Circle 63, inside back cover



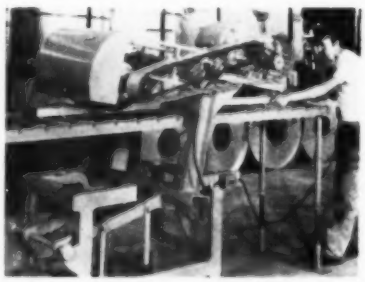
MEASURING INDICATING GAGE may be changed from ID to OD by moving the indicator or rest pins to different positions. Standard units have maximum measuring depth of 1 in. and a length range to 54 in.—*Size Control Co, 2500 W Washington Blvd, Chicago 12, Ill*

MORE DATA? Circle 64, inside back cover



SEMI-AUTOMATIC CUTTER-GRINDER is offered by Ingersoll as a companion machine to its recently announced fully automatic model (AM—Mar 23 '59, p170). Semi-automatic grinder may be obtained either as a complete unit or by having power control parts added to manually actuated Ingersoll cutter grinders—*Ingersoll Milling Machine Co, Rockford, Ill*

MORE DATA? Circle 65, inside back cover



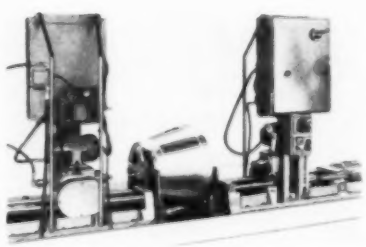
Polishing Machine Satin Finishes Broad Metal Surfaces

New polishing equipment incorporates the Merit Flex-Drum, a resilient sanding roll designed to produce high-quality, uniform finishes on broad metal surfaces such as sheets, extrusions, etc, flat and contoured. Material, either bars or strips, is fed into the equipment which brings the drum into controlled contact with the work surface. Unit is equipped with either rollers or a conveyor belt; stock is carried through, then removed manually or, in large production runs, drops into a stack or hopper.

Flex-Drum is formed of a series of abrasive flaps attached in segments to the surface of a rotating mandrel. During rotation, centrifugal force causes the abrasive leaves to extend and exert a smooth abrasive brushing action on the work. As the leaves wear down, new abrasive is constantly exposed. Drum will work contours and depressions in the surface without necessity of cutting down high spots. Constant flailing action of the flaps eliminates tendency of the abrasive cloth to load on soft metals. Unit is available in widths up to 60 in. for polishing panels, sheets, or gang-runs of extrusions up to this max width.

Merit Products, Inc, Los Angeles, Calif

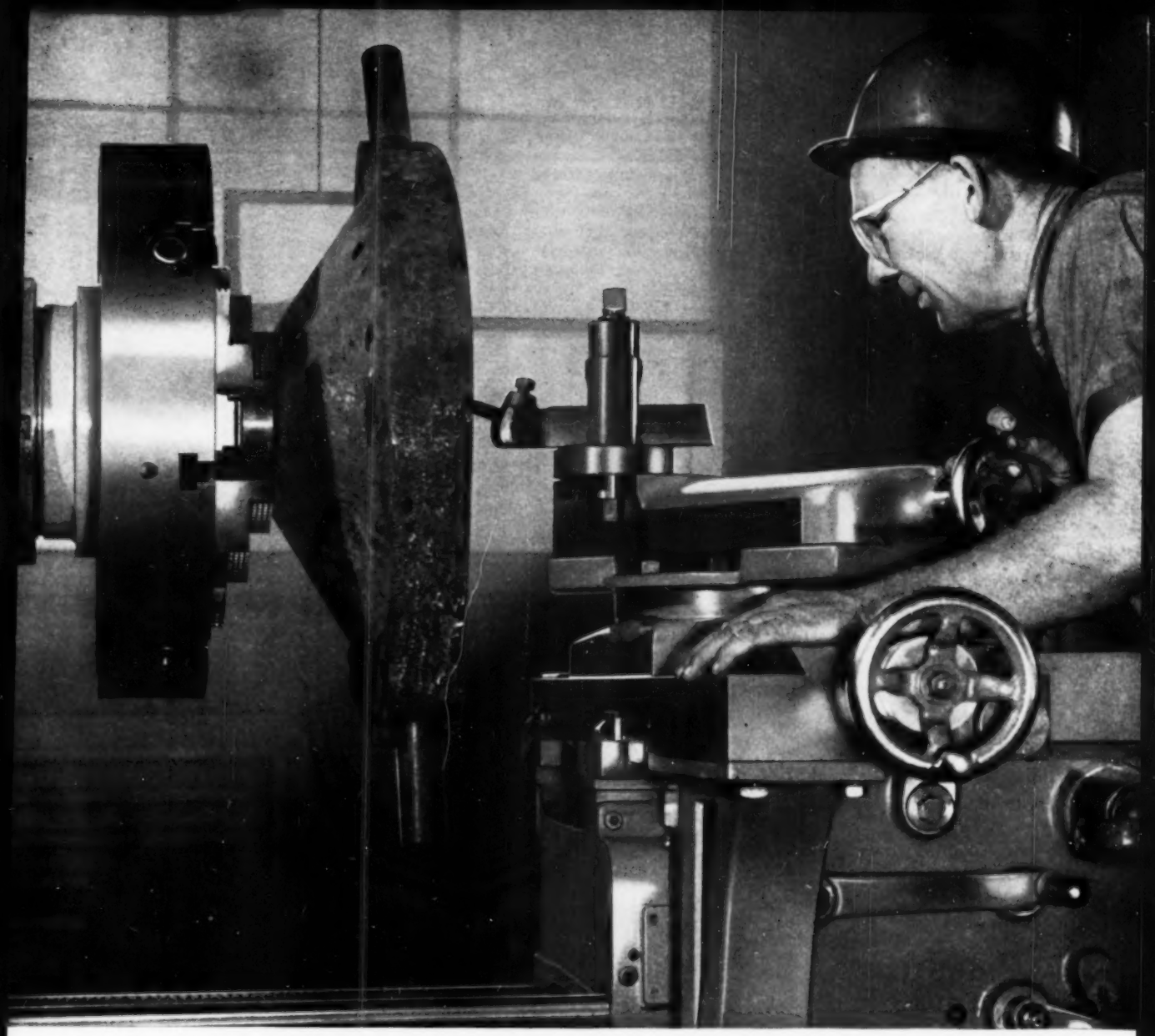
MORE DATA? Circle 66, inside back cover



Drill Unit Provides High Accuracy In Deep Hole Drilling Operations

Model 2400-A, designed for continuous high accuracy deep hole drilling of small diameter blind or through holes 3/32 to ⅝ in., provides for drilling up to 24-in. depth.

Positive synchronization of spindle speeds with feeds at all times is accomplished by a gear and worm arrangement between the spindle and



Operator machines $1200 oblique-shaped, 31" diameter cross-head plate on Nebel extension bed gap lathe in half the usual time.

Odd shapes to 40" dia. machined to .0004" in ½ time on NEBEL extension bed gap lathe

The Port Arthur, Texas plant of Koppers Co., Inc., works with flammable gas under high pressures. Equipment maintenance demands perfect machining, with accuracy to four ten thousandths inches. The firm installed a Nebel extension bed gap lathe to obtain this precision, plus the extreme versatility necessary to swing large, odd-shaped parts.

The 28"/50" Nebel, with its 120" centers, 52" swing through the gap, and load-carrying capacity of over 37,000 pounds, satisfies Koppers' need for a "universal" unit. It has eliminated "shut-down time" in production, machining overnight pieces that previously required weeks of delay for replacement, being impossible to chuck or face on an ordinary lathe. Often, the machine "doubles" as an engine lathe.

Set up and geared for metric threading, ranging from 1.75 to 80 threads per mm., offering a precision impossible and impractical with competitive machines, the Nebel cuts machining time in half on most jobs, including the numerous special alloys used by Koppers.

Learn how the incomparable accuracy and flexibility of a Nebel extension bed gap lathe can save you time, money and space. Write for free detailed bulletins on the complete line today!

NEBEL LATHES

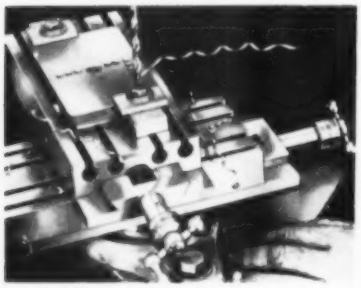
Nebel Machine Tool Corporation
Central Parkway, Cincinnati 25, Ohio

CIRCLE 275 READER SERVICE CARD

feed which can be adjusted by pick-off gears. This eliminates the tendency toward speed up or slow down, however slight, which is encountered with air, hydraulic, or other secondary power sources. Preloaded, precision ball bearing mounted spindle, powered by a 3600-rpm Dynabrake motor and timing belt drive, takes a standard ¾-in. Pratt & Whitney gun drill shank. Rapid return is powered by a ½-hp Dynabrake motor. All essential controls—cycle start, emergency stop and return, and jog backward and forward—are provided on the control panel.

20th Century Machine Co, 6070 E 18 Mile Rd, Utica, Mich

MORE DATA? Circle 67, inside back cover

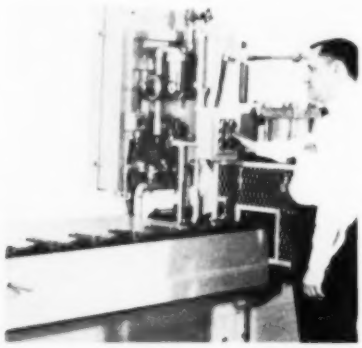


Universal Table Can Be Used For Drilling, Milling, Shaping

Universal table is claimed to possess almost unlimited position control for great flexibility in milling, drilling, or use on a shaper. Both upper and lower slides have graduated swivels and may be turned through 360° individually or together. Each slide has a feed screw with micrometer collar reading in thousandths of an inch. Precision work surface is 4 x 8⅞ in. and maximum travel is 4 in. for either slide.

South Bend Lathe Works, 425 E Madison St, South Bend 22, Ind

MORE DATA? Circle 68, inside back cover



AUTOMATIC ASSEMBLY MACHINE handles 1200 aluminum automobile engine components per hour. This over-and-under series machine indexes 8½ in. between stations and incorporates an air hydraulic booster which operates a stitching die. The four-part components measure 3¼ x 6½ in.—*Benerson Corp, Station A, Box 4126, Evansville, Ind*

MORE DATA? Circle 69, inside back cover

Bendix Machine Control Unit Controls 3 out of 4 Motions

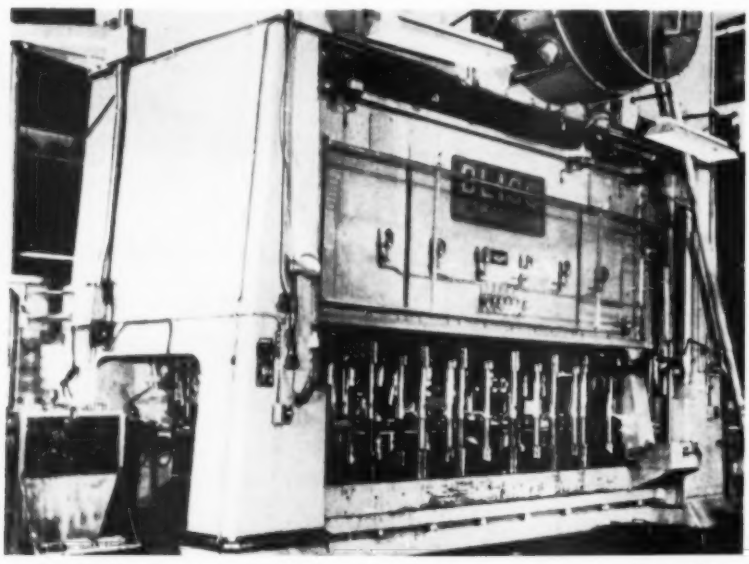
Bendix machine control unit is designed for switchable simultaneous continuous control of three out of four motions of rigid, high accuracy four-axis milling machines.

The control unit provides the normal three axis control standard to any milling machine, with the additional feature of being able to switch from a linear motion to a rotary table or tilting spindle. Because all four axes of machine tools are seldom in use simultaneously, this system is said to be an economical method of achieving four axis control.

Command pulse values from the control unit to the machine tool of from 0.0002 in. to 0.000025 in. can be achieved with this system. Input to the control unit is punched tape. A high speed tape reader handles 300 lines per second forward and 600 lines per second reverse.

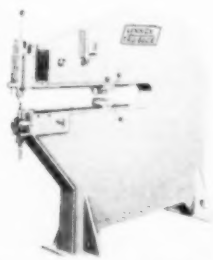
Bendix Industrial Controls Section, Bendix Aviation Corp, 21820 Wyoming Ave, Detroit 37, Mich

MORE DATA? Circle 71, inside back cover



16 BEARING CAGES A MINUTE are produced for Timken by this 1500-ton straight-side, two-point eccentric press which works in combination with a transfer feed unit that handles heavy-gage coil stock—*E W Bliss Co, 1375 Raff Rd, SW, Canton 10, Ohio*

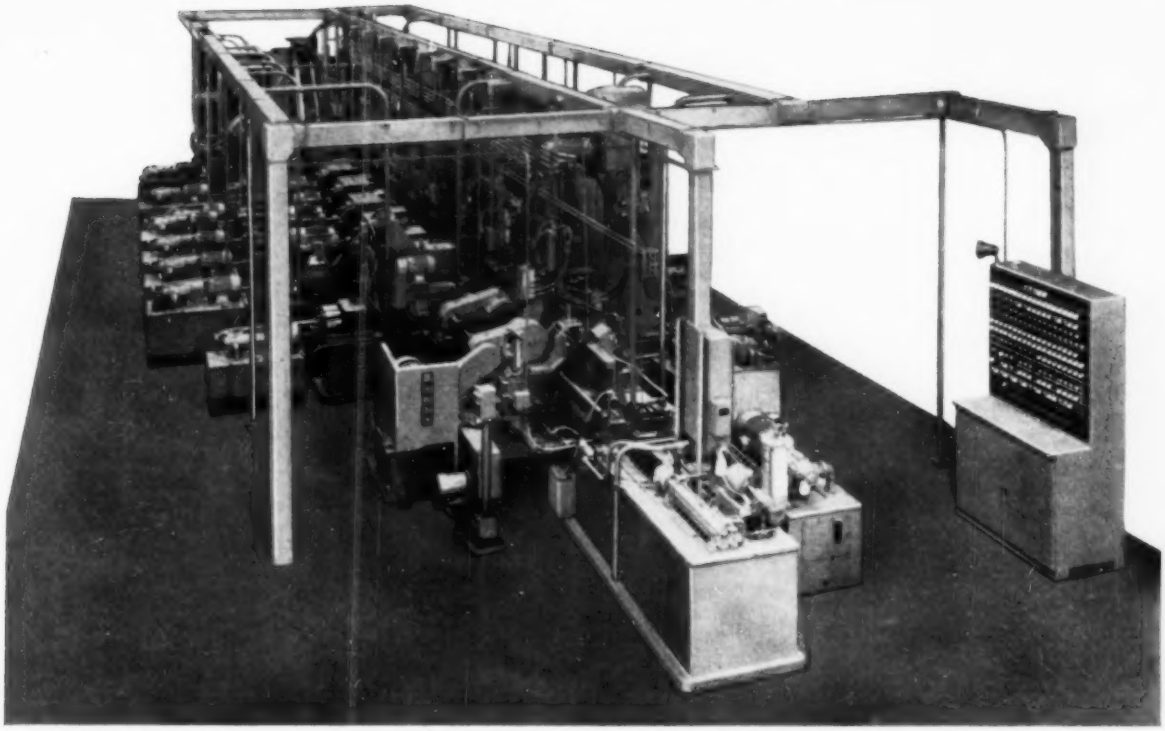
MORE DATA? Circle 70, inside back cover



New, Larger Metlmastr Offered For Shearing, Forming, Piercing

Model TE-281 added to Tru-Edge line has a max edge-cutting capacity of 9/32 in. in mild steel plate and 3/16 in. in stainless. Throat depth is 49¼ in. permitting circle cutting up to 48 in. dia inside the throat.

Like its predecessors, it operates



drilling...boring...grinding...facing...sawing...

AND INTO THE BINS

A large automotive manufacturer is using this completely automated BAKER transfer line for machining bearing caps for 12-cylinder truck engines. At a production rate of 70 parts per hour at 100%, this 24-station line machines the parts and finally separates the individual caps for delivery to their respective bins. Phone jacks allow the operator to instantly contact any station.

Designed according to the "building-block" concept, these BAKER special machines can be converted to other operations at a minimum retooling cost. This is another example of how BAKER flexibility repays the initial investment in terms of future economy.

For free information on how BAKER special machines can solve your production problems, write to BAKER BROTHERS, INC., DEPT. AS-659, 1000 POST STREET, TOLEDO 10, OHIO.

LEFT: Bearing caps cast in one cluster. RIGHT: Seven bearing caps after machining and separating. This special BAKER transfer machine also handles similar parts for 6-cylinder engines.

BAKER®

SPECIAL MACHINE TOOLS

STANDARD AND SPECIAL DRILLING AND TAPPING MACHINES • COMPRESSION MOLDING MACHINES • AUTOMATIC BAR MACHINES

with a reciprocating upper and stationary lower tool. Infinite range of tool strokes is available from 0.035 in. length through 0.250, with strokes per minute (in relation to material thickness) being automatically regulated when setting stroke length. Model has a cutting speed of up to 36 fpm, with number of cuts per minute from 1750 to 3500. It cuts straight, circular, inside or irregular shapes, slots and louvers, as well as performing beading, planishing, flanging, edge bending, joggling, nibbling, and hole piercing operations.

New features include vibrationless operation with simplified drive mechanism; adjustable bottom shearing die; material can be started with ram in operation; no starting holes required for inside cutting.

Lennox Tool & Machine Builders, Dept MM-1 137, Lima, Ohio

MORE DATA? Circle 72, inside back cover

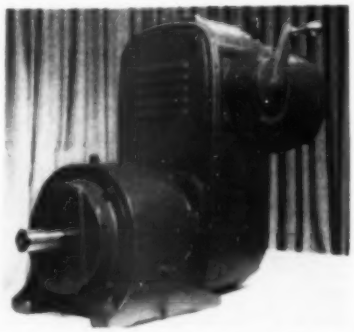
Lightweight Height Size Gage Is Accurate to 50 Millionths

Dimensional gage, named Hyt Size Gage, is accurate to 0.000050 in. and is said to eliminate the need to assemble gage blocks. Through the use of a transfer gage it is possible to inspect drill jigs, lathe fixtures, gears, cams, splines, profiles, and contours. The Hyt gage is also claimed to simplify setting pricise depths on drill presses and similar machines.

Features include: spring-loaded non-rotating spindle that eliminates backlash, measuring surfaces accessible from front and back, slots in the base that permit clamping it in a horizontal position. It is supplied in a 10-in. model, with 3 and 6-in. riser blocks and an 18-in. transfer gage available as accessories.

Van Keuren Co, Watertown, Mass

MORE DATA? Circle 73, inside back cover



Packaged Adjustable Speed Drives Offered by General Electric

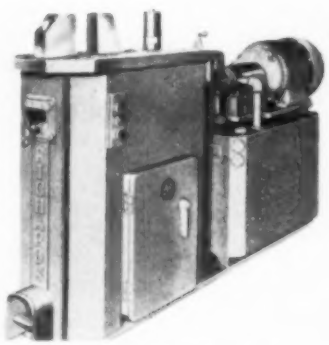
Polydyne series, available in a wide range of outputs and speed ratios, operate on the principle of V-belt-connected, adjustable pitch pulleys. Features include ease and simplicity of belt changing, smooth operation of the stepless control mechanism, and compact design.

Drives are offered from ¼ through 25 hp (ac) in output speeds from 5 to over 4000 rpm, with standard speed variations of 2, 3, 4, 5 to 1. "Maximum Speed Variation" (ranging from 6/1 at 25 hp to 10/1 at 1 hp ratings and below) is also available.

Accessories include remote mechanical, remote electric, and pneumatic actuated controls. Remote electric speed indication systems, available in standard accuracies of 2% and 3% full scale, feature the new General Electric DO-91 panel instrument, DB-18 instrument, and an ac tachometer generator especially adapted for the new drives.

General Electric Co, Schenectady 5, NY

MORE DATA? Circle 74, inside back cover



Hydraulic Benders Process Stock Up to ½ by 8 in.

Two new models added to the Multiform line are the BB-H (illustrated) for handling a wide range of bends on stock up to ⅜ x 6 in., and the BB-C, a heavy-duty machine that will bend ½ x 8-in. copper. The former is equipped with a 10-hp motor, the latter a 15-hp. Both models incorporate a constant-power hydraulic system which, through toggle action, provides a constant source of power regardless of the thickness of material being formed. The BB-H is capable of speeds from inching through 21 strokes per minute; the BB-C operates on a complete cycle of 4 seconds.

Standard tooling is provided with each machine to produce a wide variety of bends, eliminating the need for special tooling job-by-job. Easy, fast setup of the units makes special bends economical. Model BB-H is equipped with a pedal control; BB-C is electronically operated.

J A Richards Co, 903 N Pitcher St, Kalamazoo, Mich

MORE DATA? Circle 75, inside back cover

Junior Flat Polisher Handles Cross Sections up to 12 x 4 in.

Junior flat grinder is designed to grind, polish, and deburr flat surfaces of material with cross sections up to 12 x 4 in. Belt tension and oscillating idler roll pressure are held constant by automatic air control to provide uniform finish and higher belt life. Continuous 111-in. long abrasive belts in widths from 6 to 12 in. can be used in either wet or dry operation.

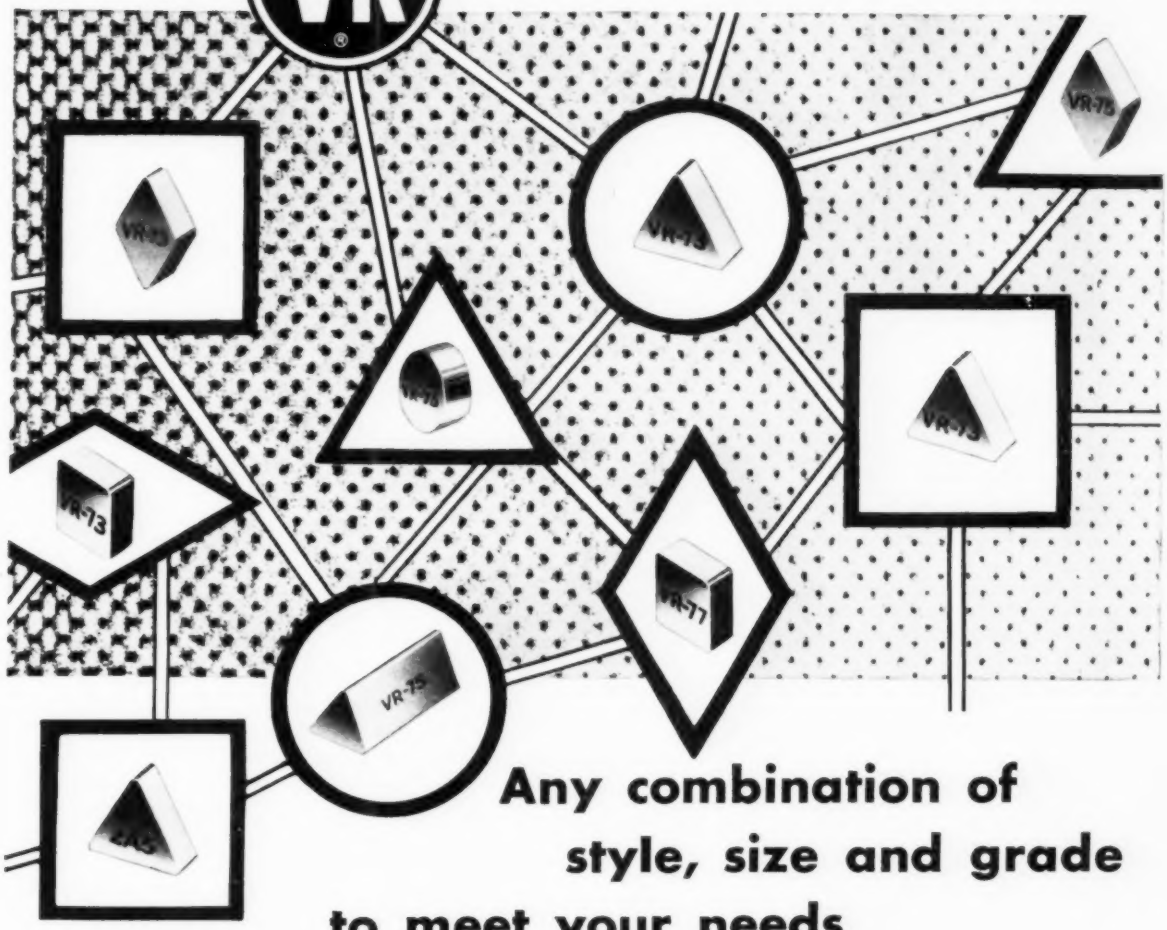
A hand wheel on the outside of the unit is used for adjustment for changes in work thickness. Abrasive belts can be changed quickly by a manually operated air valve.

Machine will handle material in coil, sheets, bars, blanks, manufactured or cast parts. They can be arranged in tandem and can be fed by conveyor, pinchrolls, or coiling equipment.

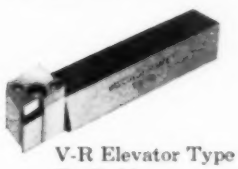
Murray-Way Corp, Box 180, Maple Rd East, Birmingham, Mich

MORE DATA? Circle 76, inside back cover

V-R carbide inserts...



Any combination of style, size and grade to meet your needs



V-R Elevator Type Toolholder.

V-R Solid Base Type Toolholder.

Complete machining flexibility is possible only when you can get exactly the right combination of carbide insert grade, size and style . . . when you need it. That's why V-R manufactures the *most complete line* of inserts available anywhere. Regardless of the operation to be performed or the type of material to be machined, there's a V-R carbide insert that's best for your job. Ask your V-R representative. He will be glad to show you how V-R's complete line can provide fast answers to your cutting tool problems.

Send for Catalog VR-58 for complete details.

V-R Vascoloy-Ramet corporation

PRIME MANUFACTURERS OF REFRACTORY METALS ENGINEERED FOR THE JOB

C-743

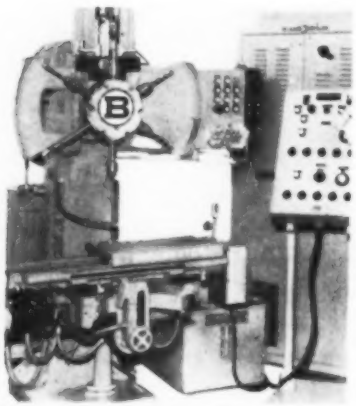
836 Market Street • Waukegan, Illinois

Sunnen Honing Machine Has Extended Working Range

Working range of Model MBB-1290 D now covers hole diameters from 0.100 in. through 2.625 in. with tooling available from stock, and to 4-½ in. with tooling built to order. Surface finish is to 2 mu-in. in hard materials. Dimensional accuracy is guaranteed to 0.0001 in. Tolerances of 0.000025 in. can be held when required.

Sunnen Products Co, 7910 Manchester Ave, St. Louis 17, Mo

MORE DATA? Circle 77, inside back cover



Improved Hydraulic Circuit for Burgmaster Drilling Machines

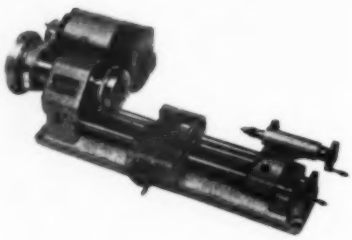
Improved hydraulic circuit for Burgmaster 2 BH and 3 BH automatic hydraulic turret drilling, tapping, and boring machines is reported to provide a positive constant feed rate in and out, whether the machine is cutting air or actually machining a part. The circuit is available in kit form for a do-it-yourself addition to machines already installed in shops.

According to the manufacturer, the new circuit, when used for tapping, eliminates pulling out the last thread or opening up the size of the threaded hole. Also, there is no chance for the machine to settle after making a set-up or slow down when the cutting tool starts to cut.

The circuit includes a Vickers pressure compensating hydraulic valve which meters oil in and out of the head end of the cylinder. A flow meter, optional equipment, indicates the spindle feed in inches per minute. A Vickers pressure compensating flow control valve permits accurate calibration of the flow meter.

Burg Tool Mfg Co, Inc, Gardena, Calif

MORE DATA? Circle 78, inside back cover



MINATURE MACHINE TOOL, no bigger than a typewriter, turns out parts with tolerances down to 0.004 in. Named Unimat, this Austrian-made machine can be set up as a lathe, drill press, milling machine, band saw and many other tools.—*American Edelstaal, Unimat Div, 350 Broadway, NY*

MORE DATA? Circle 79, inside back cover

Motorized Speed Reducer Doubles Machine Capacity

Double capacity from light drillpress and lathe equipment can be obtained with installation of a new motorized, quick-change machine speed reducer called Pull-Gear. In addition to increased capacity from the greater number of machine speeds, unit also provides instant changing to turning speeds slow enough for reaming, tapping, boring, and similar operations on light-duty machines. Speed reducer also serves as a torque multiplier in the reduced speed ranges, permitting heavier-than-normal cuts to be taken.

The ½-hp unit bolts directly to standard machine mounting plates. Changing from a high to a low turning speed is accomplished by shifting a lever. Where hand shifting is

MULTI-UNIT AUTOMATIC performs 22 operations on small bronze water meter castings. Three units with multi-spindle auxiliary heads drill, countersink, and tap at a gross rate of 720 parts per hour. A six-spindle probing unit keeps the machine from indexing if any hole is not the correct depth—*Kingsbury Machine Tool Corp, Kenne, NH*

MORE DATA? Circle 80, inside back cover

At PIC Design Corp., too...

EVERY PRECISION CLASS 3 GEAR MUST CHECK OUT ON THE S&F GEAR TESTER

Sensitivity of the S & F Tester is illustrated by this "Graphotest" recording of a Precision Class 3 gear being checked out at PIC Design Corp.

When you're cutting 100-tooth gears within a total composite error of .0002" on a *daily production basis*, there's no margin for guesswork. And they do it as a matter of routine at PIC Design, East Rockaway, New York, a subsidiary of Benrus Watch Co.

Here you'll see this precision manufacturer checking out *every* Precision Class 3 and Class 2 gear on an S & F Gear Tester. They know their gears can be only as accurate as the instrument that tests them. And there's no gear tester as accurate as the S & F.

Wherever plants take their gear accuracy seriously, (and more and more plants do), the S & F Gear Tester is revolutionizing inspection procedures.

Make sure the gears you make—or buy—are as accurate as they're supposed to be. Check them on an S & F ... guaranteed to repeat within .00001".

May we demonstrate the S & F Tester for you? Or send you names of nearby users?

KO KURT ORBAN COMPANY, INC.
36 Exchange Place, Jersey City 2, N. J.

CIRCLE 278 READER SERVICE CARD

impractical, as in lathe operation, a lever mechanism attached to the machine frame provides for mechanical shifting to required speeds.

Bandsaws, milling machines, boring mills, shapers, and similar light-duty units can be powered by the Pull-Gear. Unlimited range of reduction ratios permits obtaining proper speeds for machining aluminum, cast iron, plastics, and wood.

Pull-Gear Co, 25425 Mound Rd, Warren, Mich

MORE DATA? Circle 81, inside back cover

Abrasive Blast Nozzle Said to Retain Orifice Size Longer

For shot, grit, and sand blasting, the Uniflo nozzle is reported to retain its original size longer, thus keeping the blast concentrated to speed cleaning and save compressed air. Nozzle is tungsten carbide and the jacket is kirksite, a shock-resisting alloy of zinc, aluminum, copper, and magnesium.

According to the manufacturer, the nozzle gives at least 200 times longer life than ordinary hard iron nozzles and costs 20 to 48% less than other nozzles in its class. It is available in orifice sizes of 3/16 to 3/4 in.

W W Sly Mfg Co, Cleveland 1, Ohio

MORE DATA? Circle 82, inside back cover

ALUMINUM CHIP BUGGY weighs 180 lbs, 40% less than similiar steel buggies, but can handle loads up to 1800 lbs. It is fabricated of 3/16 in. aluminum.—*E W Bliss, Rolling Mill Div, Salem, Ohio*

MORE DATA? Circle 83, inside back cover

56-piece Gage Block Set Available From DoAll

New set of gage blocks, No. 56-R, is said to be the first basic change in set composition in 40 years. Designed on the basis of actual shop applications, the 56-R set exceeds the range of the 81-piece set and is second only to the 121-piece set, according to the manufacturer.

All standard snap ring grooves, O-ring grooves, and keyways can be measured with these blocks. They provide direct measurement of fractional dimensions down to 1/64 in., measurement by thousandths from 0.020 in., and measurement by tenths from 0.120 in. Sets are available in grades from AA (±0.000002 in.) to "Shop Blocks" (+0.000006 in., −0.000002 in.).

DoAll Co, Des Plaines, Ill

MORE DATA? Circle 84, inside back cover

Swiss Automatic Screw Machine Equipped With 6-Spindle Turret

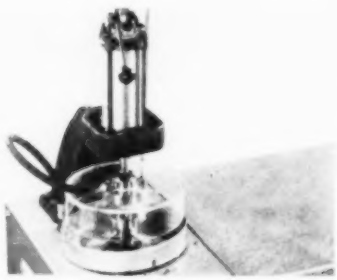
Petermann automatic screw machine (Swiss), equipped with six transversal tools and a six-spindle turret, eliminates secondary operations by completing a component as far as is possible on an automatic screw machine. Capacity of the machines range to 1-1/16 in.

Features include built-in gearbox for both feed and spindle speed settings, electronic camshaft variator, headstock with Nadella needle bearings, plan-lever flat cam headstock advance, automatic lubrication, and micro-differential micrometers.

Turret drum has six spindles, which can be arranged in any sequence of rotating and stationary spindles. Rotating spindles can be used for drilling, tapping, or external threading. Spindle speeds are obtained by positioning electrical contacts which operate one of the three electro-magnetic clutches.

Dist by Arthur Loeffel Co, Inc, Merrick, NY

MORE DATA? Circle 85, inside back cover



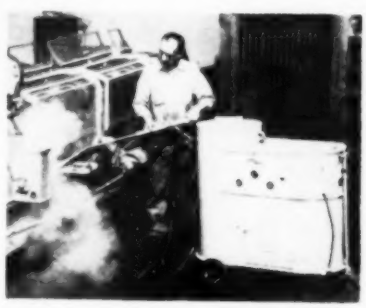
Bench-type Washer Cleans Bearings Without Disassembly

Model MC-4-1 bench-type ball and roller bearing washer completely cleans bearings up to 5-in. dia without requiring removal of seals or shields. Average time for each bearing is 30 to 60 seconds. Bearings up to 14 in. dia may be spray washed inside the machine.

Solvent and air, under pressure, is used for cleaning. The cleaning solution is continuously filtered through a series of filters which removes all particles larger than one-half micron. Unit occupies bench space of 18 by 30 in. and costs approximately $1000.

Bearing Inspection, Inc, 3311 E Gage Ave, Huntington Park, Calif

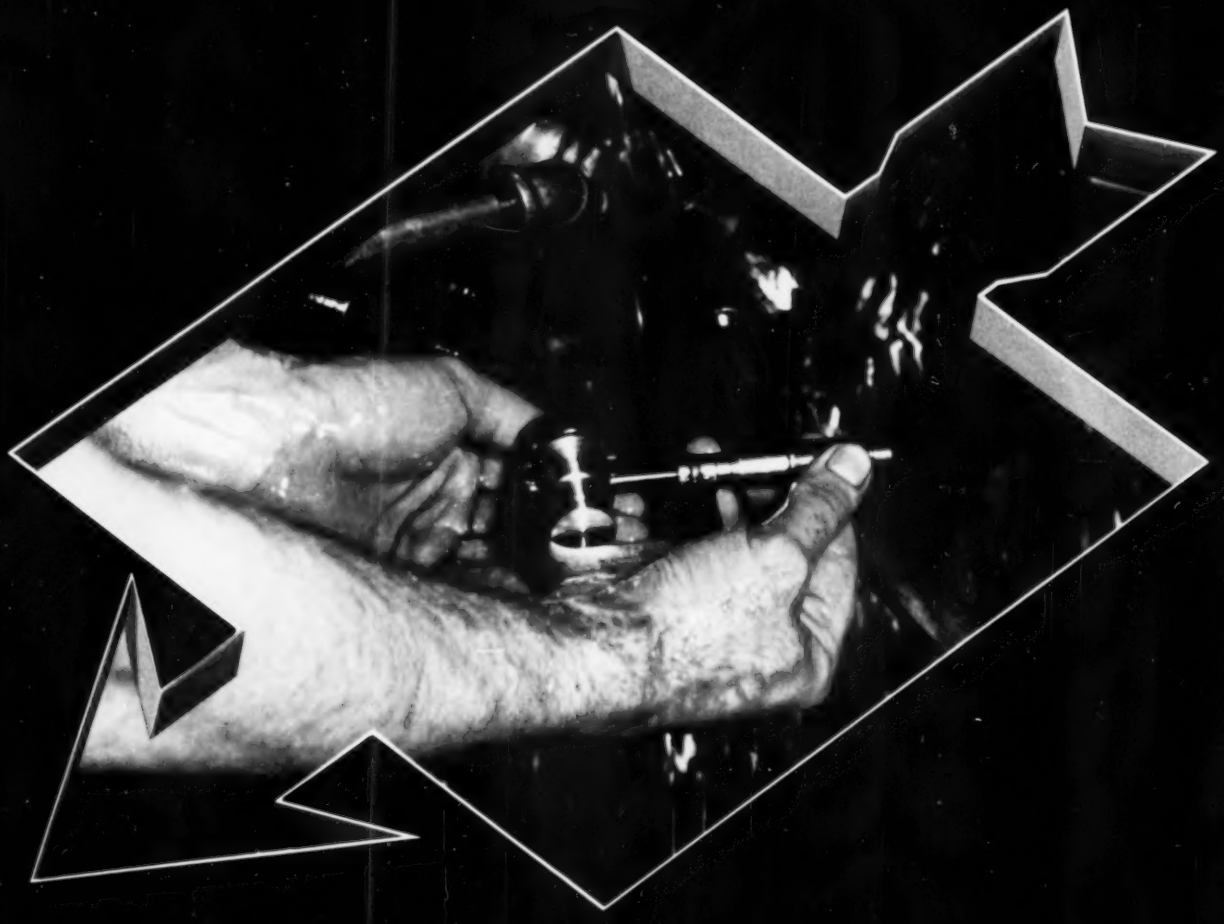
MORE DATA? Circle 86, inside back cover



Lowcost Steam Jet Cleaner Is Portable, Oil-fired, Automatic

Speedystream 100 is a portable 100 gph oil-fired steam jet cleaner which sells for less than $500. Operating on

Quality . . . the best economy of all



He does a better job when he can see what he's doing

You increase operator efficiency as well as production when you use transparent, heavy-duty Sunicut cutting oils. Operators work better, because Sunicut oils let them see tools and workpieces, see the finish, see micrometer graduations.

Sunicut oils don't stain hands and clothing. They pump easily, wet metal fast, and give excellent extreme-pressure lubrication.

To prove to yourself the economy of Sun quality, ask your Sun representative to help you select the right grade of Sunicut for your heavy-duty cutting requirements. Or write to SUN OIL COMPANY, Dept. I-13, Philadelphia 3, Pa.

•

In Canada: Sun Oil Company Limited, Toronto and Montreal.

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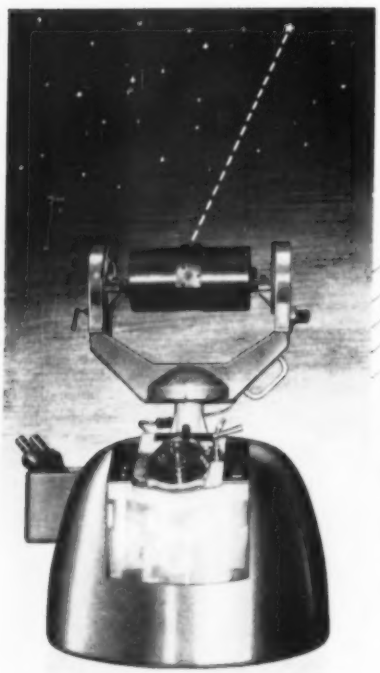
SUNOCO®



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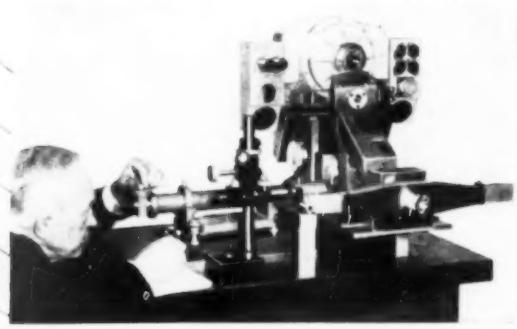
EXTREMELY ACCURATE TEST STANDS FOR Inertial Guidance Systems?

see VINCO

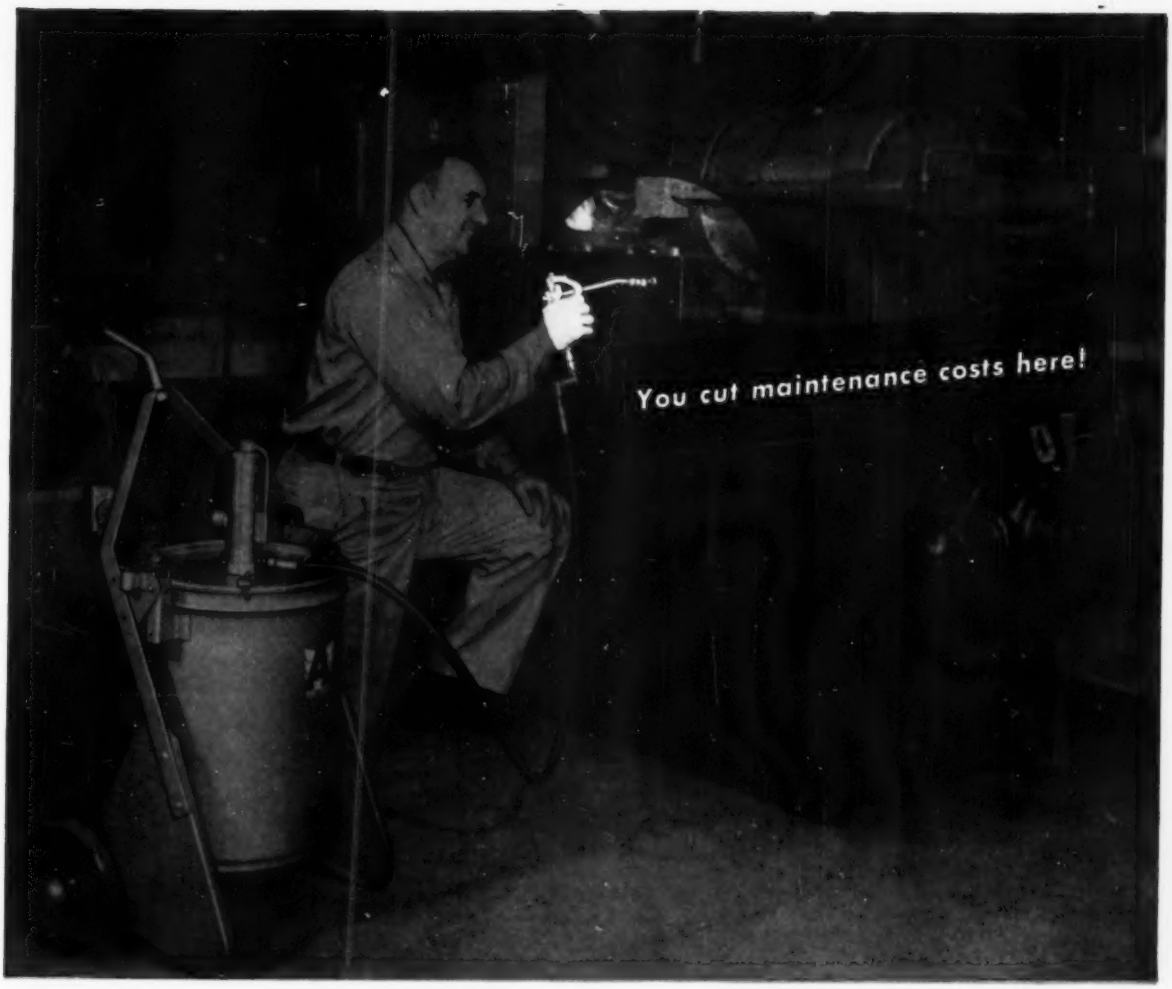
Precision has been Vinco's most important product for more than thirty years. The ability to work to extremely close tolerances is an indispensable asset to the missile manufacturer requiring Gyro System Test Stands.

Vinco manufacturers extremely accurate test stands complete with gearboxes. These gearboxes isolate the Gyro System from the effect of the earth's rotation. Vinco invites you to submit your guided missile test stand problems.

Inspection of a Vinco Sidereal Gearbox by an autocollimator and polygon reflector segment. Output accuracy limit of complete gear train is 3.6 seconds of arc; gear ratio 2,584,800 - 1.



VINCO CORPORATION
9111 Schaefer Highway
Detroit 28, Michigan



Alemite Portable Lubricator Saves 95 Man-Hours For Every Drum of Lubricant Applied!

Every point of lubrication in your plant can cost you needless time and money if you use old-fashioned hand lubrication methods!

With this Alemite portable air-powered lubricator, you save *95 man hours* for every 400-lb. drum of lubricant applied. Over *two* weeks of one man's time saved. That's how you can cut maintenance costs with Alemite.

In addition, Alemite's Model "711-A" is so compact and portable that it can bring clean, waste-free lubrication to *any* machine—*anywhere* in your plant—reducing machine downtime and prolonging machine life. Its pivot-swing dolly holds container upright at any pulling angle for easy moving over rough ground, indoors over rough floors, even up and down steps!

Step up to fast-moving, time-saving lubrication methods! Check Alemite's complete line of air-powered and electric-powered lubrication equipment for industry.

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Company .....

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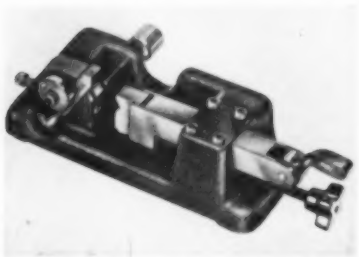
City ..... Zone ..... State .....

kerosene or No. 1 or No. 2 fuel oil, the cleaner has fully automatic ignition and fuel pressure is modulated to develop the desired gun-nozzle pressure.

Heating coils are ½ in. dia, continuous wound for maximum efficiency and tested for 1000 psi. Unit delivers automatically controlled cleaning pressures from 50 to 150 psi in 90 seconds. Controls and 5-gal soap tank are built in. Equipment includes ½-hp motor, 20 ft of wire-braided ½-in. steam hose and hose rack.

Steam Generator Div, Pantex Mfg Corp, Pawtucket, RI

MORE DATA? Circle 87, inside back cover



Adjustable Fixture Offered For Drilling Safety-Wire Holes

Model SW-15 safety-wire adjustable drill fixture is a low-priced holding fixture for ¼ to 1½ in. hexagons, nuts, bolts and similar pieces. The exact location of the safety wire hole in the corners of the hex or in round bodies is completely adjustable. Fast finger-tip pressure on the cam lock instantly clamps and releases parts to be drilled.

Ace Drill Bushing Co, Inc, 5407 Fountain Ave, Los Angeles 29, Calif

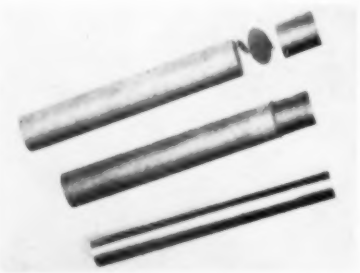
MORE DATA? Circle 88, inside back cover

trate even during the cleaning cycle.

Filters, using permanent tubular elements of Monel metal, remove more than 95 per cent (by volume) of suspended solids. When grinding wheel swarf is used a pre-coat, it will filter out particles to 3 microns; if filter-aid additive is used, it will filter out particles down to ½ micron.

American Laundry Machinery Co, 5024 Section Ave, Cincinnati 12, Ohio

MORE DATA? Circle 89, inside back cover



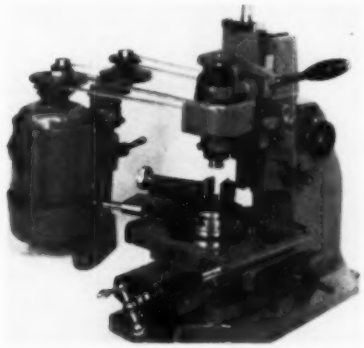
Alloy Disc Forms Strong Carbide-to-Steel Bond

An alloy called Plymet in the form of thin wafers is said to form the most powerful bond known in joining cemented carbide to steel. It can be used for carbide tipped blanking punches, molding punches, high impact turning tools, drills, and applications for carbide tipping that was previously impractical.

Bonding works as follows: Plymet disc is inserted between the carbide tip and the steel shank. Pressure of about 500 psi is applied to the joint as it is heated by acetylene torch or induction coil to between 1900 and 2000 F for approximately one minute. The bond is formed by the rapid diffusion of the interfaces of the carbide, Plymet, and steel. Joints have rupture strength of 100,000 to 135,000 psi.

Powder Alloys Corp, 316 Colfax Ave, Clifton, N J

MORE DATA? Circle 90, inside back cover



German Vertical Milling Machine Has 0.0002-in. Working Accuracy

New bench type vertical milling machine manufactured by Erhard Jauch of West Germany is designed for high speed production of small, precise parts. Adjustment of the vertical feed of the spindle by means of micrometer stops makes it possible to obtain a working accuracy of 0.0002 in.

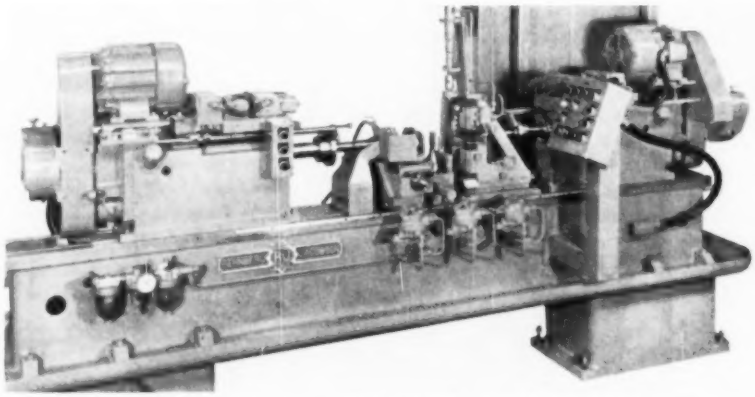
The machine, Type VFS 10, is available with or without automatic feed and can be furnished with special roller bearings for speeds up to 12,000 rpm. Both milling cutters and twist drills can be mounted. It is said to be particularly suitable for recessing and countersinking with carbide tipped tools.

Distributed by A and H von Tsurikov Co, 755 Lake Ave, Rochester 13, NY

MORE DATA? Circle 91, inside back cover

Continuous Flow Coolant Filters Are Automatically Self-Cleaning

Line of automatic pressure-type filters for cleaning cutting oils, coolants, and lubricants consists of eight models ranging in capacity from 600 to 10,000 gph. All are automatically self-cleaning, and supply clean fil-

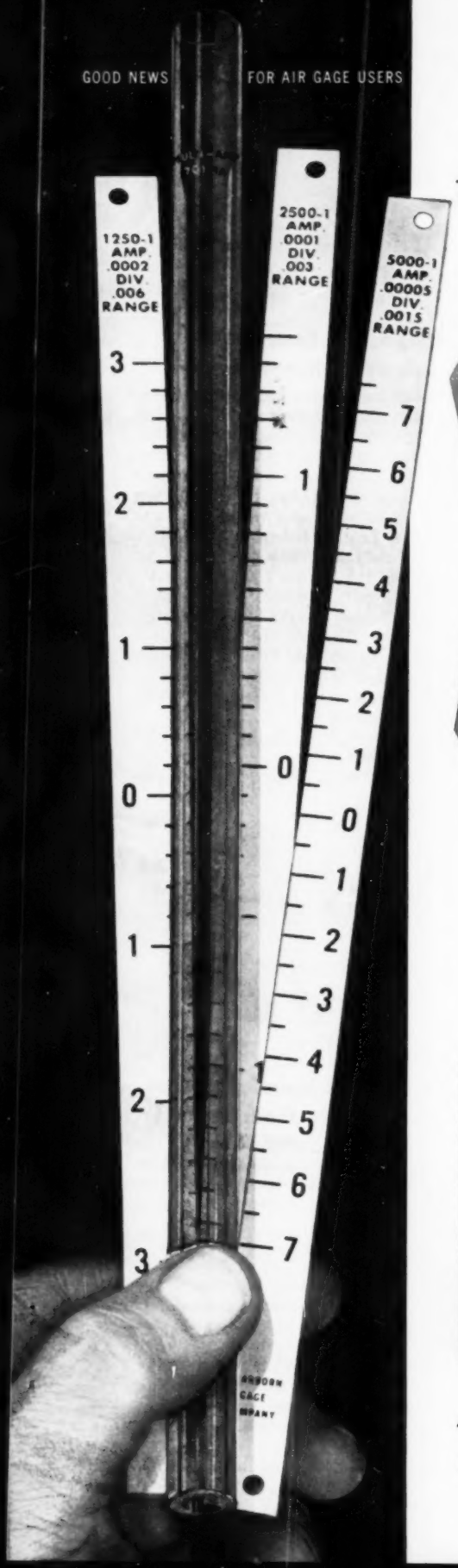


VALVE PLUGS ranging in size from 6 to 26 in. long and 2 to 6 in. dia are centered and spotfaced on this special machine equipped with two 8-in. stroke hydraulic quill units—*Rehnberg-Jacobson Mfg Co, 2135 Kishwaukee St, Rockford, Ill*

MORE DATA? Circle 92, inside back cover

GOOD NEWS FOR AIR GAGE USERS

Just 1 tube serves three amplifications



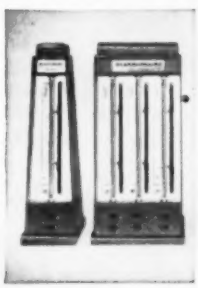
. . . and it's available now exclusively with

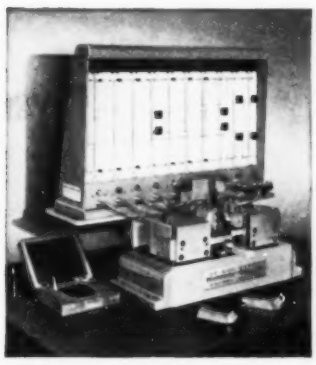
Dearbornaire Column-Type Air Gage Instruments

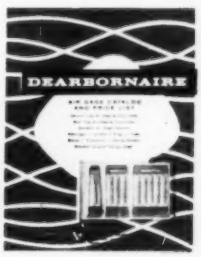
No fussin' around with single-purpose parts! Now, with Dearbornaire's new "Multi-Amp" Tube, you can convert an instrument from one amplification to another simply by changing calibrated scales. What's more, this unique new tube has a "characterized" variant rate of internal taper which . . .

1. Creates an air circuit that is truly linear over the full extent of the calibrated scales to give you finer accuracy of measurement. 2. Permits greater clearance between tube wall and float, thus minimizing down-time for cleaning and maintenance. 3. Allows up to three times greater total element gaging clearance to reduce wear, extend life, and cut gaging costs.

Dearbornaire Instruments are offered as single or multiple column units in amplifications of 1250-1, 2500-1, 5000-1, and 10,000-1 or in any combination thereof.







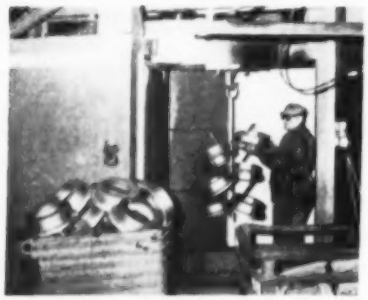
New Catalog contains complete price information on Dearbornaire Instruments and Air Gage Cartridges, Spindles, Rings, Snaps and Fixtures. Send for your free copy today!

Air Gage Division

DEARBORN GAGE COMPANY

32330 Ford Road • Garden City (Detroit), Michigan

CIRCLE 282 READER SERVICE CARD



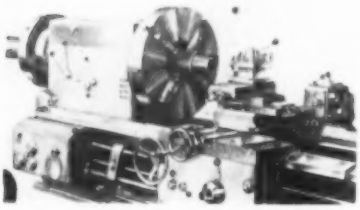
Blast Cleaning Cabinets Offered For Medium Capacity Production

The Spinner Hanger cabinet is a general purpose airless blast cleaning machine designed to meet the needs of users whose production rates outstrip the capacity of standard blast equipment, but are not large enough to require installation of specialized high production cabinets. A single machine can be used to clean a large variety of parts.

The machine features compartmented work areas, spinner devices for rotating the work while it is blasted, Wheelabrator airless blast units, and work carrying fixtures. Indexing arrangements turn the compartments so that one is always exposed to the operator for loading and unloading. Blasting can be done in one or several stages and is continuous in operation.

Wheelabrator Corp, Mishawaka, Ind

MORE DATA? Circle 93, inside back cover



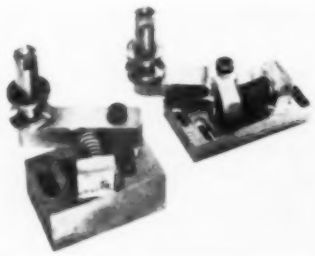
Belgian Lathe Equipped With Device for Automatic Threading

Demoor lathes (made in Belgium) are now equipped with an automatic, single-point threading device called Hydrominic which makes the lathe a high-production threading machine, as well as a standard lathe. The device, which attaches to the rear of the carriage saddle on lathes with spindle bore up to 12½ in., permits automatic-cycle, straight or tapered threading, inside or outside.

The operator sets longitudinal stops, depending on the length of thread to be cut, then pre-selects required total infeed up to a ¼-in. cycle. Infeed at the starting point is automatically controlled and the tool travels longitudinally to the predetermined thread length, retracts on time, returns to the starting position and makes successive passes until the predetermined depth of cut is achieved. The Demoor lathe leadscrew is said to produce far more accurate results than threads generated from cams.

Dist by Stokvis Multiton Corp, 18 Secatoag Ave, Port Washington, NY

MORE DATA? Circle 94, inside back cover



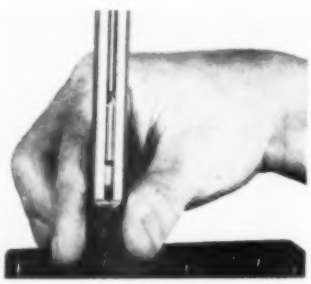
Stock Guide Compensators Offered for Stamping Presses

Spring-loaded stock guide compensators mount on the die shoe to hold coil or strip stock under the proper tension as it moves into the press. They are available as left or right-hand units and are applicable to automatic stamping operations.

Both compensators are designed for heavy-duty operation and will handle stock up to 12 gage. Radius arms are 4½ in. long and give 1½ in. in-out movement under spring tension to the guide roller. Pressure is applied to stock at center of spool.

Jolico Industries, 6345 Balfour Ave, Allen Park 10, Mich

MORE DATA? Circle 95, inside back cover



POCKET-SIZE HARDNESS TESTER, called Sklero, operates on the rebound principle and provides consistently accurate readings to ±1 point Rockwell C—*Precise Products Corp, Racine, Wis*

MORE DATA? Circle 96, inside back cover

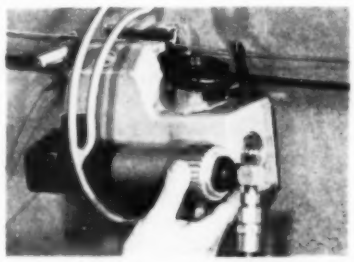
Machine-Side Conveyor Line Designed for Narrow Spaces

Lowcost conveyor only 4½ in. wider than conveyor belt is said to fit easily into cramped space between machines and within existing production lines. It can be used to transport castings, stampings, blanks, screw machine parts, and scrap to a tote box or another machine.

The portable conveyor can be set for any incline angle from 22 to 45° by adjusting the telescoping legs. It is available in 18 models with oil resistant belts that are 6 to 24 in. wide and 4 to 12 ft long. User has a choice of rubber cleats vulcanized to the belt, metal cleats bolted to the belt, or an all-metal belt.

Bosworth Mfg Co, 34250 Mills Rd, Avon, Conn

MORE DATA? Circle 97, inside back cover



Round Steel Strapping Machine Is Lightweight, Power Operated

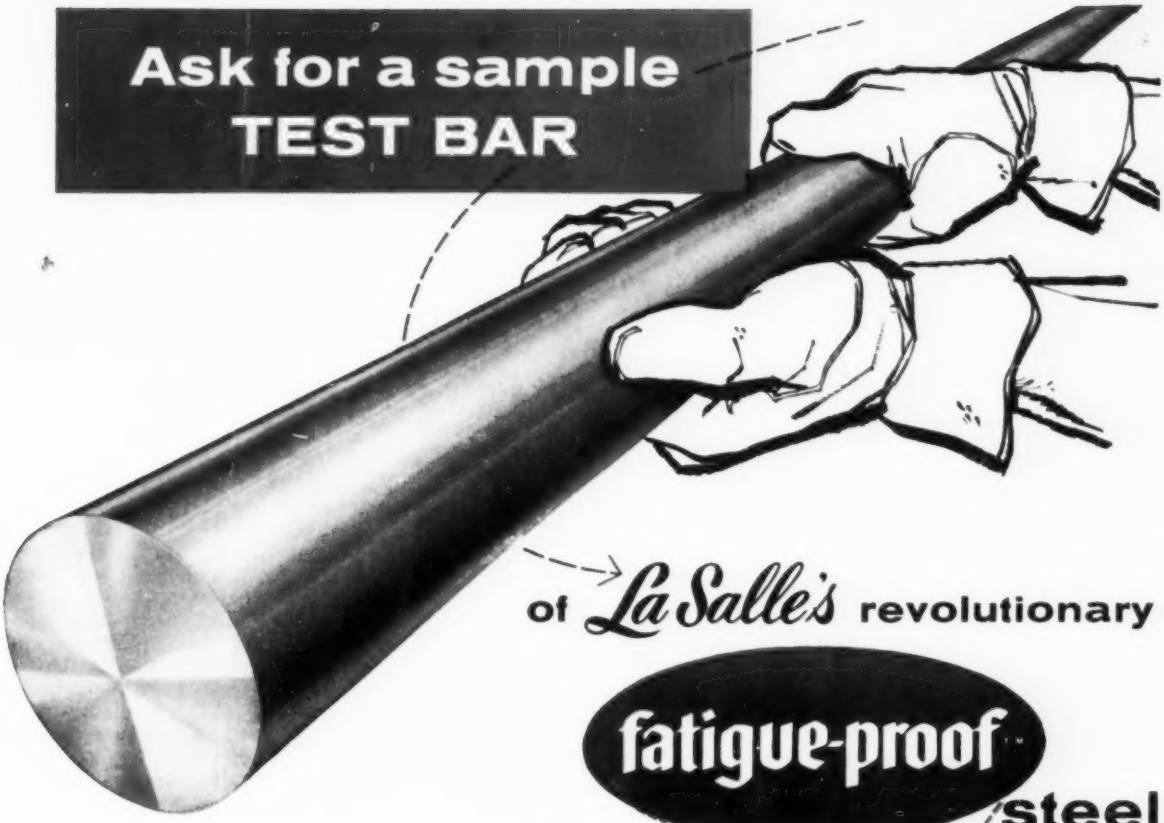
Lightweight power operated steel strapping machine tensions, ties, and cuts round steel strapping for virtually any size package in one operation.

Model 13 weighs 20 lbs, measures 11 by 7 by 6¼ in., operates on 65 lbs of air pressure. It can be held by the operator or suspended from a counterbalancing mechanism as illustrated. The machine uses round steel strapping directly from the coil and requires as little as three seconds to strap many packages.

U S Steel Corp, 208 S LaSalle St, Chicago 90, Ill

MORE DATA? Circle 98, inside back cover

Ask for a sample TEST BAR



of La Salle's revolutionary

fatigue-proof steel

The steel bar that has high strength WITHOUT HEAT TREATING

Yes, La Salle invites you to test a sample bar of the remarkable new FATIGUE-PROOF. This amazing new material is its own best recommendation . . . as proven by the many original equipment manufacturers who have already tested (and are using) FATIGUE-PROOF.

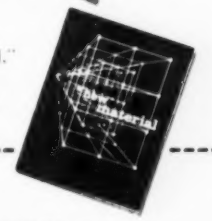
If you are making parts requiring strengths in the tensile range of 140,000 to 150,000 psi, and want to eliminate the expense or problems of heat treating . . . if you want to save production costs with a bar that machines faster (25% faster than annealed alloys—50% to 100% faster than heat treated alloys) and gives you a beautiful finish, too . . . if you want to improve the quality of your product while saving money, send us a blueprint, drop us a note giving application details, or better yet . . . pick up your telephone and call a La Salle sales engineer (REgent 4-7800, Chicago, Illinois).

MADE BY THE e.t.d. PROCESS

Elevated Temperature Drawing

FREE

Get your copy of "a new material," a 24-page booklet which gives detailed information on La Salle "FATIGUE-PROOF"® steel bars.



La Salle STEEL CO.

1416 150th STREET • HAMMOND, INDIANA

Manufacturers of America's Most Complete Line of Quality Cold-Finished Steel Bars

Please send me your "FATIGUE-PROOF" Bulletin.

Name_____

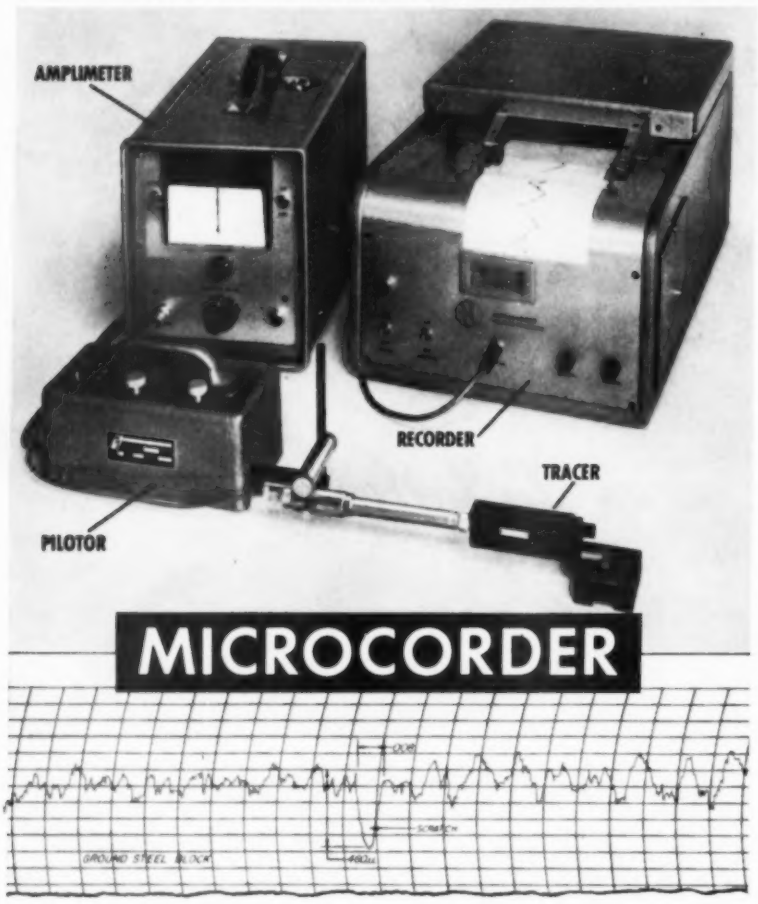
Title_____

Company_____

Address_____

City_____ Zone_____ State_____

Presenting **A NEW INSTRUMENT FOR SURFACE INSPECTION AND CONTROL**



THE MICROCORDER draws a magnified roughness profile of ID, OD and flat surfaces, for any length of trace up to 2¼". From its 4"-wide chart you can readily measure the *peak-to-peak spacing* and *peak-to-valley height* of roughness irregularities — and the *width* and *depth* of pits, scratches, chatter marks and surface porosity. A wide range of magnifications is provided.

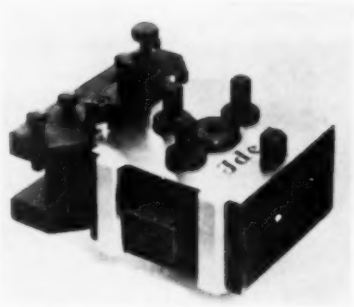
This instrument is as simple to use as a TV set, and is equally at home in shop, lab and inspection department. It is used on metals, paper, plastics, ceramics and many other materials; and it is made and guaranteed by the *pioneers* in surface-measurement instrumentation.

Detailed specifications are given in Bulletin LT138. May we send you a copy? Write —

MICROMETRICAL MANUFACTURING COMPANY
345 S. MAIN ST. ANN ARBOR 1, MICHIGAN

Manufacturer of the PROFILOMETER®, PROFICORDER®, MICROCORDER, WAVOMETER®, ANDEROMETER®, VAROMETER, CHART VIEWER • Exclusive American Sales Agent for CENSOR Dimensional Gaging and Sorting Equipment

174 CIRCLE 284 READER SERVICE CARD



Quick-Change Toolholder Is Accurate to 0.0001 in.

This Ideal quick-change toolholder eliminates chatter and maintains an accuracy of 0.0001 in. because toolholders engage the toolpost over a large profiled cylindrical area; toolholder block assembly likewise engages the compound rest of the lathe with a large area, and toolbits are gripped in the holders by means of four set screws.

Available from stock for 10 to 100 in. swing lathes, the toolholder is said by the manufacturer to cut production time in half on many jobs because of the reduction in setup and tooling time. Vertical adjustment is made by a knurled screw with locknut—no spacers or shims are required.

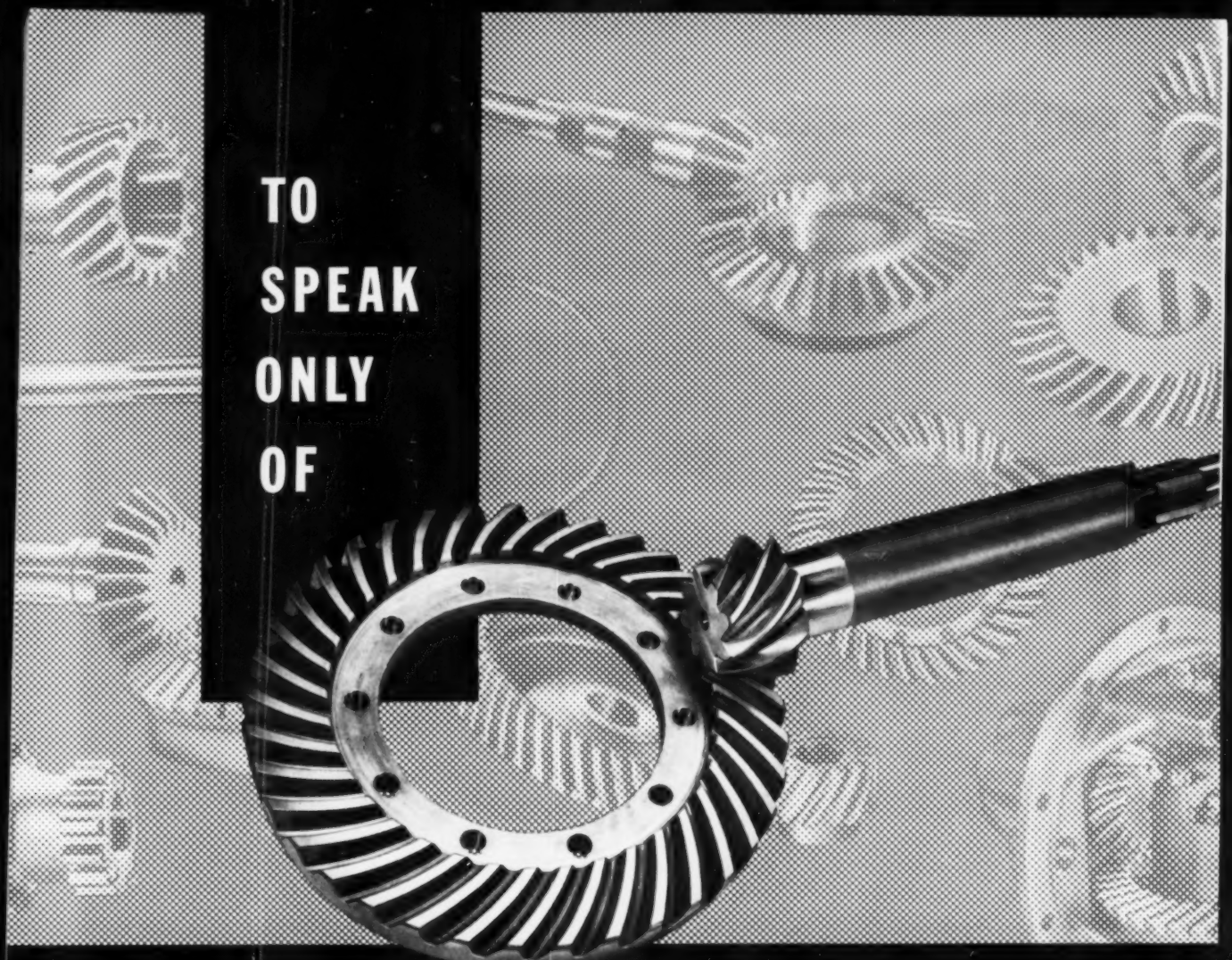
Concord Engineering and Mfg Co, Los Angeles, Calif

MORE DATA? Circle 99, inside back cover

Spline Gage Combines Function of Five Gages

Splinedicator combines the function of five gages, replacing the go no-go composite rings and master plugs for each, and provides a master ring to check the spline gage for the internal spline.

The gage indicator is set by means of a master setting plug of verified tooth thickness. The Splinedicator is said to give an accurate check of the effective tooth thickness, elimi-



SPIRAL BEVEL GEARS

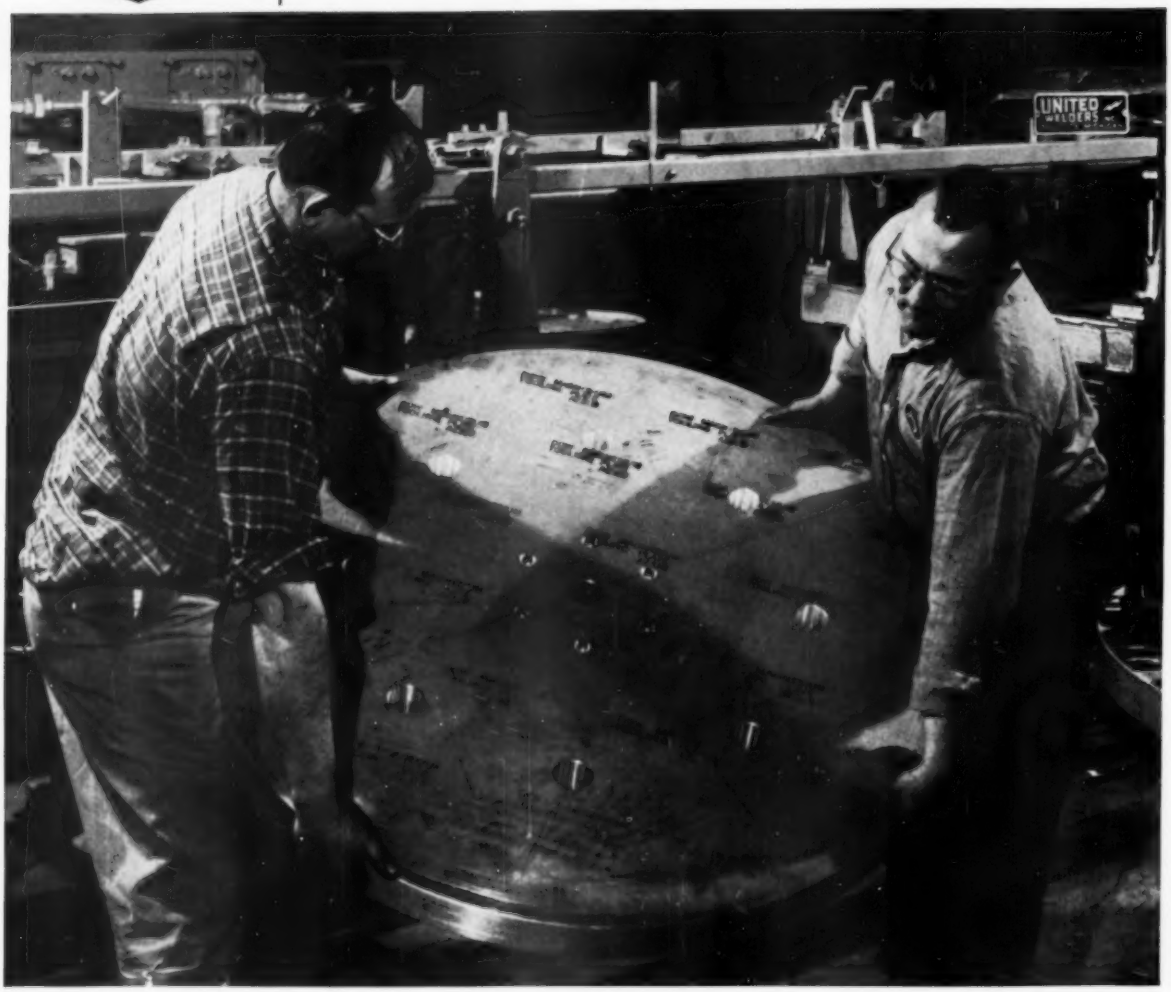
Spiral bevels comprise just one of the ten gear types in which we specialize, but, speaking of them alone, we have been active in their manufacture since their wide-spread acceptance around 1920. Thus, our experience covers the entire history of this versatile and useful gear type. We were among the first to use lapping on a production basis and to emphasize the importance of lapped and mated gear sets. Automotive Gear was one of the pioneers in developing and promoting the use of special fixtures to eliminate, as much as possible, the chance of human error, and in this way furthered the progress and practicality of spiral bevel installations. Engineering aid in the design of these fixtures for any application is always available to spiral bevel customers . . . as is aid in any area where our specialized gear experience may prove useful. Our gear engineers are available for consultation. Just write!

EATON

AUTOMOTIVE GEAR DIVISION
MANUFACTURING COMPANY
RICHMOND, INDIANA

GEARS FOR AUTOMOTIVE, FARM EQUIPMENT AND GENERAL INDUSTRIAL APPLICATIONS
GEAR-MAKERS TO LEADING MANUFACTURERS

DOW | MAGNESIUM PRODUCTS

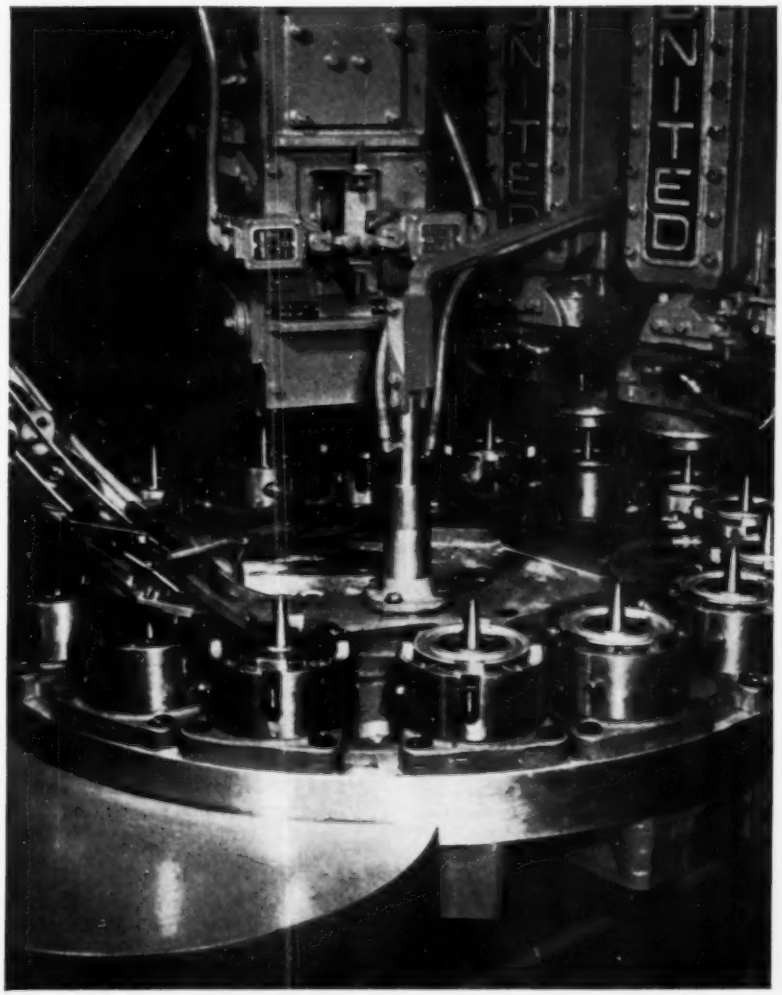


10¢ PHONE CALL CUT MACHINING TIME 50% ON 3-FT. INDEX TABLE!

Ordered-by-phone magnesium tooling plate disc replaced cast steel index table for machinery manufacturer . . . "as purchased" flatness cut previous machining time on this part in half . . . saved 50% on machining costs.

United Welders Inc., of Bay City, Michigan, recently replaced steel with magnesium tooling plate in making the precision index table, or dial, for their automatic 8 Station Dual Dial Welder. This machine is used in welding the bottom gasket retainer for an oil filter assembly in 1959 automobiles.

The dials previously were made of cast steel which required costly, time-consuming surface and edge machining to finish. The 2½ inch by 36 inch dials of magnesium tooling plate are now purchased rough-cut to size from the local Dow magnesium distributor, and are finished by simply edge truing and drilling. Because the as-purchased flatness completely eliminates need for surface machining, United's machining costs on this part have been cut by more than half. Production has been speeded, too, because magnesium's light weight makes the dials easy to handle during manufacture. Two men can easily lift and handle the light disc. Cranes or lift trucks aren't needed as they were with the previous steel dials.



LIGHTNESS CUTS POWER NEEDS 75%

In the United welder above, the dial starts and stops 500 times per hour during welding operations. This lightweight magnesium dial requires only a quarter of the power needed to operate the previous steel dial. It permits a drastic reduction in the cost and size of motor, speed reducer and other necessary driving elements.

RIGIDITY MEANS ACCURATE POSITIONING

United Welders employs a Geneva Stop Movement to position parts accurately under dual automatic spot welding heads. Magnesium's rigidity helps the dial retain close tolerances necessary for continued accuracy.

Magnesium tooling plate has other advantages, too. It costs less to buy than other lightweight tooling materials and can easily be welded. It can often be obtained ready-cut-to-shape from distributors, saving additional time in your shop.

Because magnesium tooling plate is uniformly flat, it can be used for almost all tooling jobs without surface machining. It's rolled and thermal flattened to close flatness tolerances . . . high dimensional stability keeps it flat in use.

MAGNESIUM TOOLING PLATE IS AVAILABLE FROM STOCK AT:

E. F. Bailey Company
Seattle, Washington

Clendenin Bros., Inc.
Baltimore, Maryland

Copper and Brass Sales, Inc.
Cleveland, Ohio; Detroit 12, Michigan

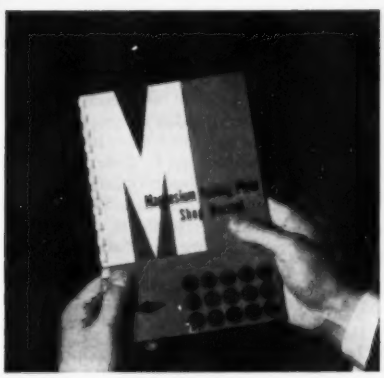
Fullerton Steel and Wire Company
Chicago 35, Illinois

Hubbell Metals Inc.
St. Louis 3, Mo.; Kansas City, Mo.; Marietta, Ga.

A. R. Purdy Co., Inc.
Lyndhurst, New Jersey

Reliance Magnesium Company
Los Angeles 58, California

Joseph T. Ryerson & Son, Inc.
Dallas, Texas



There's a wealth of information in Dow's new magnesium tooling plate manual. This handy 56-page book is filled with facts about shop working characteristics, machining, etc. For a copy, contact your Dow branch office or write to Magnesium Sales, Department 1331F6-15.

THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN

WITH Bijur Automatic Lubrication as an integral part of your machines, you benefit from continuous peak production. Plant after plant reports increased out-put and greatly reduced maintenance costs with Bijur-equipped machines. Costly downtime for lubricating by hand is eliminated. Every bearing is metered the proper quantity of oil at predetermined intervals. Work spoilage and bearing troubles caused by over-lubrication are avoided. Fire hazards are reduced. Personnel accidents are prevented.

More than a million Bijur-protected machines are currently in use. Hundreds of leading manufacturers standardize on Bijur as "built-in" components of their machines. Bijur emphasizes custom engineering, and will gladly cooperate with your machine builder in designing a lubricating system to meet the specific requirements of the machines you order.

Bijur designed into your machines now automatically assures satisfaction. It makes sense . . . and dollars, too! Why not write today for literature and engineering information?

BIJUR AUTOMATIC LUBRICATORS—STANDARD EQUIPMENT IN MANY INDUSTRIES
Machine Tools • Business Machines • Printing Machinery • Textile Machinery • Food Product Machines • Bottling Machines • Packaging Machines • Sheet Metal Machines • Plastic Fabricating Machinery • Glass Products Machinery • Wood-Working Machinery • Industrial Sewing Machines • Special Process Equipment

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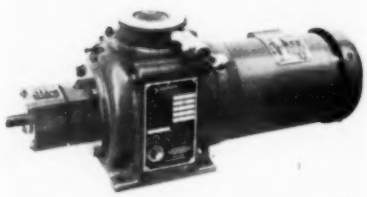
BIJUR
LUBRICATING CORPORATION
Rochelle Park, New Jersey

Pioneers in Automatic Lubrication

nate human error, shorten inspection time, detect back taper, afford unlimited gage life, and is adaptable for semi-automatic gaging. It will repeat in the same index position with the master within 0.00005 in. and will repeat in any index position with the master within 0.0001 in.

Vinco Corp, 9099 Schaefer Hwy, Detroit, Mich

MORE DATA? Circle 100, inside back cover



Planetary Reducer Features Infinitely Variable Speed Drive

Planetary reducer offers a high torque, infinite range drive having speed ranges from 300 rpm to zero to one revolution per hour to zero, with speeds accurately set to one part in four thousand. It develops a torque of 100 in. lbs.

In addition to the planetary reducer, the transmission can be furnished with standard output to provide speed ranges from 1800 rpm to zero or any of a variety of built-in step-up or step-down assemblies. Transmission is available with controls including micrometer, remote micrometer, remote electrical, pneumatic and automatic types.

Graham Transmissions Inc, Menomonee Falls, Wis

MORE DATA? Circle 101, inside back cover

Live Center Features Triple Bearing Design

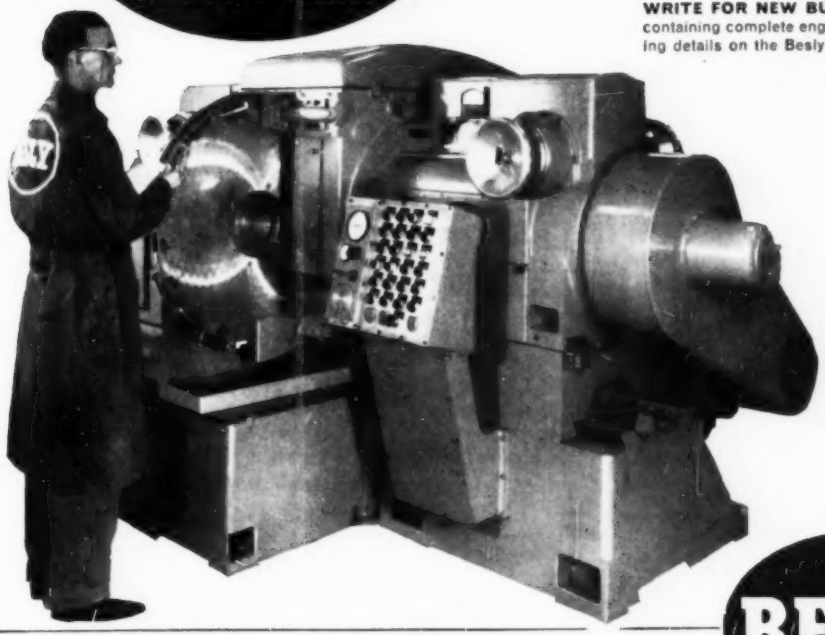
The Rotor live center has a triple bearing design which fully supports the workpiece through the entire length of the shank. Two adjustable roller bearings are used with a large thrust bearing to take all axial thrust of the workpiece. Built-in Simmer

·Greater Accuracy
·Less Downtime
·Lower Costs!

NEW
BESLY
DH4 Double Horizontal Spindle Disc Grinder

This new grinder is built for top accuracy plus substantial economy. The exclusive Besly precision quill and clutch infeed provides for feed increments calibrated in millionths. Abrasive discs can be changed in 30 minutes without disturbing setup (a 200% saving in downtime over conventional disc grinders)! Dressing time is cut to four minutes (a 500% saving)! Coolant is always under control and the cooling system is insulated from the grinder. Get full facts today . . . convince yourself that the Besly DH4 will help you do better work at lower cost.

WRITE FOR NEW BULLETIN
containing complete engineering details on the Besly DH4.



BESLY-WELLES CORPORATION
120 Dearborn Ave., South Beloit, Illinois

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Grinders and Abrasives • Taps • X-Press Taps® • Drills • Reamers • End Mills • Tool Bits • Gages • Carbide Tipped Tools, Blanks, Lapped Toss-away Inserts and Holders

Bearings, Inc. converts plain bearings to anti-friction bearings... cuts maintenance and lubrication costs... increases production!

Many of our customers have realized considerable savings by converting to anti-friction bearings. Our bearing engineers recommend the best bearings for each type of application, design and supervise production of the special housings often required.

The result is a clean, economical conversion that is quickly installed and materially reduces maintenance and lubricating costs. Production, with better quality, is usually increased.

Ask a BEARINGS, INC. engineer to survey your production machinery. He may be able to suggest and recommend bearings that will increase production at lower cost. Changeovers from plain bearings to anti-friction bearings are a specialty with us.

Call the BEARINGS, INC. branch nearest you NOW!

Providing bearing service in the North

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INDIANA: Ft Wayne • Indianapolis • Muncie • Terre Haute • **PENNSYLVANIA:** Erie • Johnstown • Philadelphia • Pittsburgh • York
WEST VIRGINIA: Charleston • Huntington • Parkersburg • Wheeling • **NEW JERSEY:** Camden
NEW YORK: Buffalo, Balanrol Corp. • **MARYLAND:** Baltimore • **DELAWARE:** Wilmington

and

in the South

DIXIE BEARINGS, INC.

FLORIDA: Jacksonville • **GEORGIA:** Atlanta • **KENTUCKY:** Louisville • **LOUISIANA:** Baton Rouge • New Orleans
N. CAROLINA: Charlotte • Greensboro • **S. CAROLINA:** Greenville • **TENNESSEE:** Chattanooga • Kingsport • Knoxville • Nashville

oil seals protect bearings from dirt and chips.

They are available from No. 1 to No. 6 MT and in large interchangeable head bull centers. Centers are spring-loaded to compensate for heat expansion in machining the workpiece. Manufacturer guarantees accuracy of concentricity to 0.000080 in.

Webster Machine Products Co, PO Box 92, Thompson Rd, Webster, Mass

MORE DATA? Circle 102, inside back cover

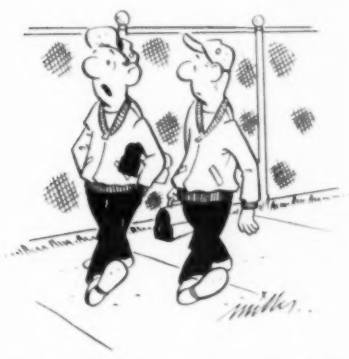
Relieving Fixture Produces S Point on Twist Drills

Model S sharpening fixture is designed to produce a spiral point on twist drills; to provide proper relief in sharpening Weldon countersinks and deburring tools; and to sharpen taps. The fixture may be adapted to sharpening a wide variety of other types of cutting tools requiring radial and/or axial relief.

Unit can be used with most types of tool and cutter grinding machines. A fine feed for longitudinal travel is built in. Twist drills pointed on the fixture are said to offer these advantages: self centering, better hole size and finish, and longer life.

Weldon Tool Co, 3000 Woodhill Rd, Cleveland 4, Ohio

MORE DATA? Circle 103, inside back cover



"The last time I got a raise, I went out and recklessly blew it all on a celluloid collar!"

ONLY

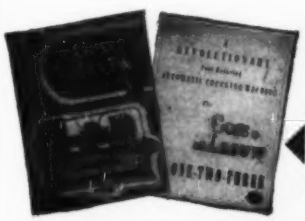
GOSS and DeLEEUW AUTOMATIC CHUCKERS offer the 1-2-3 feature

This NEW development—unsurpassed for speed, convenience of tooling and precise finish—involves no retooling problem even for short runs. It assures greater production at lower cost on all classes of work.

The unique "1-2-3" feature, exclusive with Goss & De Leeuw, provides the means for performing one to three right or left hand single or double threading operations simultaneously or in sequence, without changing set up.

Here's an ideal machine tool for small lot requirements because of quick, easy changeover. Any class of chuck work can be handled economically in any quantity.

The examples of work shown here are typical of the wider variety of parts being produced on these new machines.



SEND FOR detailed information on this new machine. Let us have samples of your work in order to give you time and cost estimates for handling it on the "1-2-3" Goss & De Leeuw.

GOSS & DeLEEUW

GOSS and DE LEEUW MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

CIRCLE 291 READER SERVICE CARD

SIMONDS

INDUSTRIAL CUT GEARS

LARGE OR SMALL HEAT TREATED OR PLAIN

SIMONDS has over 60 years' experience in cutting quality industrial gears. We can supply any type of gear in cast or forged steel, gray iron, bronze, Meehanite, rawhide or bakelite in a full range of sizes adaptable to the material. Also heat-treated, case or flame hardened gears of carbon or alloy steel. Send us your requirements for quotation.

Custom GEAR CUTTING

SIMONDS' facilities can produce any type of custom gear from your blanks if you prefer. Same quality . . . same prompt service.

QUALITY GEARS FOR OVER 65 YEARS

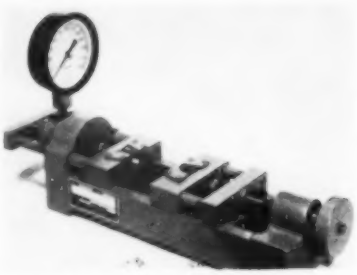
SPUR GEARS
BEVEL GEARS
MITRE GEARS
WORMS WORM GEARS
RACKS PINIONS

Also stock carrying distributors of Ramsey Silent Chain Drives and Couplings; and industrial V-belts.

SIMONDS GEARS

THE SIMONDS GEAR & MFG. CO.

LIBERTY at 25TH PITTSBURGH 22, PA.



Portable Tensile Testers Handle Round or Flat Specimens

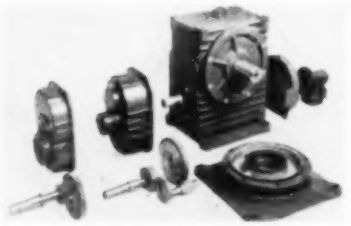
Testers are not dependent on outside power since load is applied manually by rotating knurled knob. Net weight is 36 lb; applied load is measured by a trapped-oil system. Tests can be accomplished quickly by unskilled operators.

All units in the series are designated as Model THM-, with the capacity indicated after the dash (Model THM-600 is illustrated). They are available in capacities from 100 to 1000 lbs with the applied load indicated on a 4½-in.-dia gage. For the 100-lb model, gage increments are ½ lb; for the 1000-lb unit, increments are 5 lbs.

Interchangeable wedge-type jaws are used for tightly holding flat or cylindrical specimens during tests. Jaws in three sizes cover the range of flat specimen thicknesses up to ⅜ in. Jaws in three sizes over range of round specimen diameters from ⅛ to ⅝ in. Max length of test specimens is 7 in. Over-all dimensions of the units are: width, 5 in.; length, 23 in.; height, 11 in.

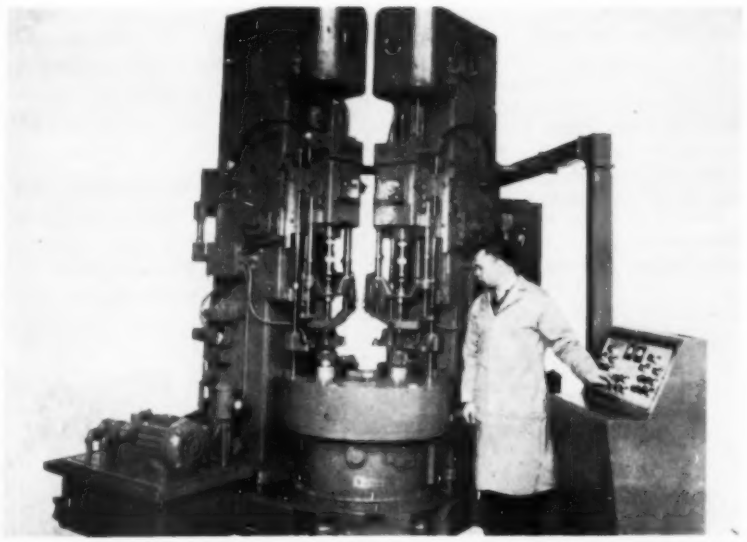
Steel City Testing Machines, Inc, 8817 Lyndon Ave, Detroit 38, Mich

MORE DATA? Circle 104, inside back cover



Worm Gear Speed Reducers Offered in Improved Line

Improvements in heavy-duty line include higher efficiency; helical attachments for double and triple reduction units combine the efficiency advantages of helical gearing with the high ratio advantage of worm gearing. Improved tooth forms, precision ground alloy steel worms, special high strength bronze gears, and precision ground helical gearing result in space savings to 50%. One



MOTOR ROTORS are honed at rate of 200 parts per hr on this Barnesdril special 2-station production honing machine. Laminated steel rotors vary from 3 to 4 in. in length in different lots. Required bore size in all parts remains constant at 0.8750-0.8755 in. with a surface finish of 25 rms. Tooling designed for this job is producing bores better than 0.0002 of size on diameter from bore to bore while removing 0.003-in. stock.—*Barnes Drill Co, 830 Chestnut St, Rockford, Ill*

MORE DATA? Circle 105, inside back cover

BATH *Tap'n Gage* TIMES

A series of technical discussions that will be helpful in getting better results from tapping and gaging operations

Vol. 1 No. 7

Subject: Gaging Full Length Dryseal Taper Pipe Threads – Symbol NPTF

There are three accepted methods of gaging Dryseal Taper Pipe threads. L1 plug and L1 ring thread gages are used to check the hand engaged portions and L3 plug and L2 ring thread gages are used to check the wrench engaged portions of the threaded product.

Six step plain plug and ring gages are sometimes used to check the taper and the crest truncation of the threaded product.

The Position Method:

This method is most commonly used but is the least accurate. It requires the use of standard plug and ring thread gages with a basic gaging notch or face. The internal thread is within permissible tolerance when the gaging notches of the L1 and L3 working plug thread gages are flush with the end of the thread within 1 turn, large or small, for all sizes except the ⅛" and ¼" sizes. The ⅛" size tolerance is ½ turn large and 1½ turns small. The ¼" size tolerance is 1½ turns large and ½ turn small. When the internal thread is chamfered, the gaging notch should be flush with the bottom of the chamfer which is at the intersection of the chamfer cone and the pitch diameter cone. The taper of the internal thread is adjudged correct if the relative positions of the L1 and L3 plug thread gages are within ½ turn of one another. The external thread is within permissible tolerance when the gaging faces of the L1 and L2 working ring thread gages are flush with the end of the thread within 1 turn, large or small. This tolerance applies to all sizes, from 1/16" to 2" inclusive. The external threads should be gaged to the first scratch of the thread on the chamfer of the product. The taper of the external thread is correct if the relative positions of the L1 and L2 ring thread gages are within ½ turn of one another.

The Limit Method:

This method, both practical and fast, requires the use of L1 and L3 plug thread gages, L1 and L2 ring thread gages; each with three gaging steps; basic, minimum and maximum. A six step plain plug gage, with three L1 and three L3 gaging steps and a six step plain ring gage with three L1 and three L2 gaging faces, may also be used. The internal thread is within permissible tolerance when the threaded product reference point is on or between the limit notches of the L1 and L3 plug thread gages. The taper is within the allowable tolerance if both of these gages enter the threaded product with the same relationship to their respective gaging notches within ½ turn e.g. if the L1 plug thread gage indicates the threaded product is a "minimum" thread, the L3 plug thread gage must also indicate, within ½ turn, that the threaded product is a "minimum" thread. The external thread is within permissible tolerance when the threaded product reference point is on or between the limit faces of the L1 and L2 ring thread gages.

As a check on taper, the L1 and L2 ring thread gages shall gage the same in relation to their respective gaging faces within ½ turn. To check the threaded product for correct taper and crest truncation, a six step plain taper plug gage and a six step plain taper ring gage is sometimes used. If the thread gages indicate the threaded product is a "minimum" thread, the plain gages must also indicate a "minimum" thread to pass inspection.

Turns Engagement Method:

Either the basic-notch or the step-limit gages may be used for gaging by this method. The gages are screwed on the threaded product and the turns to remove the gages are counted. This method compensates for the gage chamfer and eliminates the variance of the threaded product chamfer. The internal thread is within permissible tolerance when the L1 and L3 plug thread gages engage the part within the number of turns as shown in the table below. As a check on taper, the difference of their engagement must be within ½ turn of the difference in basic turns as shown in the table below. The external thread is within permissible tolerance when the L1 and L2 ring thread gages engage the part within the number of turns as shown in the table below. As a check on taper, the difference of their engagement must be within ½ turn of the difference in basic turns as shown in the table below.

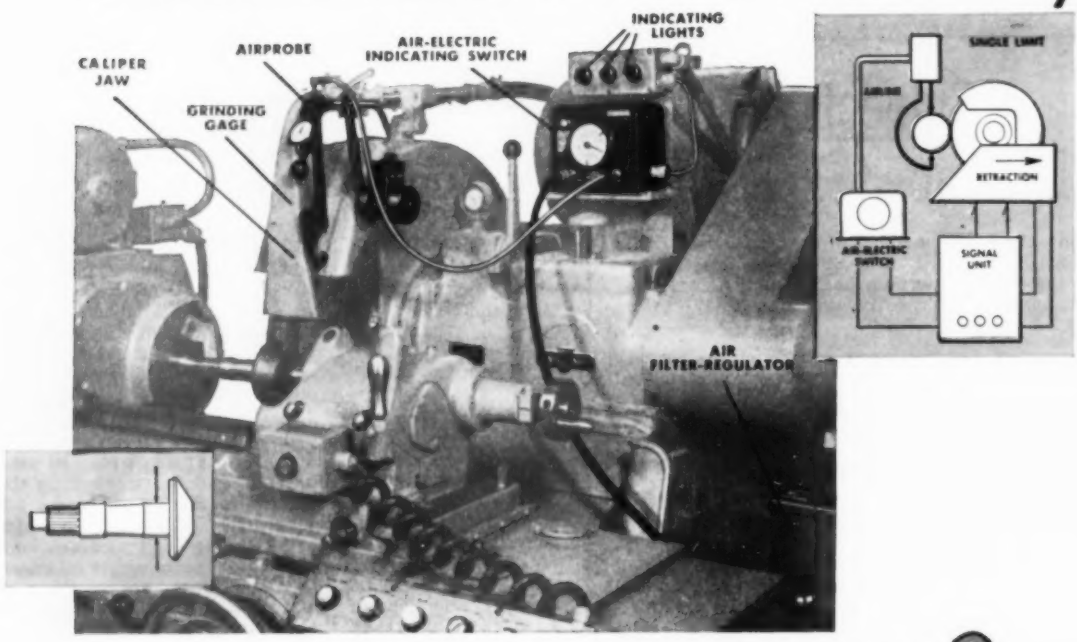
SIZE	INTERNAL THREADS				EXTERNAL THREADS			
	L1 Plug Turns Engagement		L3 Plug Turns Engagement		L1 Ring Turns Engagement		L2 Ring Turns Engagement	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1/16"	4.82	2.82	7.57	5.57	2.32	4.32	4.80	6.80
⅛"	4.86	2.86	7.61	5.61	2.86	4.86	4.87	6.87
¼"	4.60	2.60	7.35	5.35	1.60	3.60	4.98	6.98
⅜"	4.82	2.82	7.57	5.57	2.32	4.32	5.09	7.09
½"	4.98	2.98	7.73	5.73	2.48	4.48	5.22	7.22
¾"	5.25	3.25	8.00	6.00	2.75	4.75	5.39	7.39
1"	5.10	3.10	7.85	5.85	2.60	4.60	5.60	7.60
1¼"	5.33	3.33	8.08	6.08	2.83	4.83	5.88	7.88
1½"	5.33	3.33	8.08	6.08	2.83	4.83	6.07	8.07
2"	5.51	3.51	8.26	6.26	3.01	5.01	6.45	8.45

Note: The turns shown above are theoretical. For practical purposes, work to nearest ¼ turn.

•Cylindrical and Thread Gages •Ground Thread Taps • Internal Micrometers John BATH & Co., Inc.

22 Mann Street, Worcester, Mass.

MODERNIZE YOUR PLAIN GRINDING . . . *Economically!*



Automatic Control Gaging improves your grinding operation 3 ways . . .

1 It controls on the basis of finish size *only*, thus overcoming the disadvantages of timed cycle or fixed stop grinding. Wheel wear, O.D. variation in work to be ground, "give" in many of the machine elements, and flexing of the work, no longer affect accuracy and piece-to-piece uniformity of the finished part.

2 It controls *automatically*, thus you eliminate any errors caused by operator fatigue, inexperience, or inattention. The Federal automatic control gage never tires, will hold part size to .0001" or better on a good machine, and is easily adjusted to control different sizes of work. Its air-electric system overlooks minor surface irregularities which confuse size readings of other gages.

3 Automatic control gaging makes it possible for one operator to handle two grinders performing the same or different operations. Here's an actual case history of direct labor cost savings:

	MEN	MACHINES	COST PER PIECE	PRODUCTION RATE (pieces per 8-hr. shift)
BEFORE	2	2	$.03585	1344
CONTROL GAGING INSTALLED				
AFTER	1	2	$.01526	1386

SAVINGS (per piece) . . . . . $.02059
RATE INCREASE (per shift) 42
TOTAL SAVINGS (per shift) $28.59
EQUIPMENT COST AMORTIZED — 60 DAYS

HOW IT WORKS

The Federal automatic control gage measures the work continuously *as metal is being removed* and automatically retracts the wheel the instant finish size is reached.

EASY TO INSTALL

This standardized Automatic Control Gage (Model 133M-103 illustrated) is stocked for speedy delivery. Only a few components to install. Easily applied to any plain grinder having hydraulic wheel slide. Can also be used in connection with wheel slide stop to *additionally* provide spark out.

Federal control gages are also available through machine tool manufacturers for control of either plain or I.D. grinders and are supplied as part of the grinder package. When discussing machine tool requirements, be sure to specify FEDERAL gaging. Federal maintains close engineering alliance with leading machine tool manufacturers. They, too, will be glad to discuss automatic control gaging with you.

For more information, contact the nearest FEDERAL representative or write . . .

FEDERAL PRODUCTS CORPORATION
9126 Eddy Street, Providence 1, R. I.

Ask **FEDERAL** *First*

for recommendations in modern gages . . .

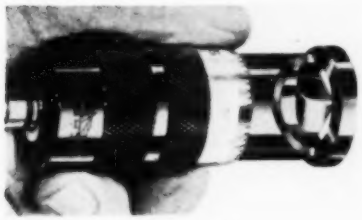
Dial Indicating, Air, Electric, or Electronic – for Inspecting, Measuring, Sorting, or Automation Gaging

basic housing design for each size makes mounting and drive arrangements more flexible. Top, bottom, or side mounting, with or without mounting base, are possible. Drive arrangements include horizontal—top or bottom, and vertical—shaft up or down.

Additional features include availability from stock of all ratios from 5-1/6:1 to 1212:1 with center distances from 3 to 21 in. All units can be supplied with a torque control attachment.

Philadelphia Gear Corp, 3620 G St, Philadelphia 34, Penna

MORE DATA? Circle 106, inside back cover



Precision Countersink Accurate to ±0.001 in.

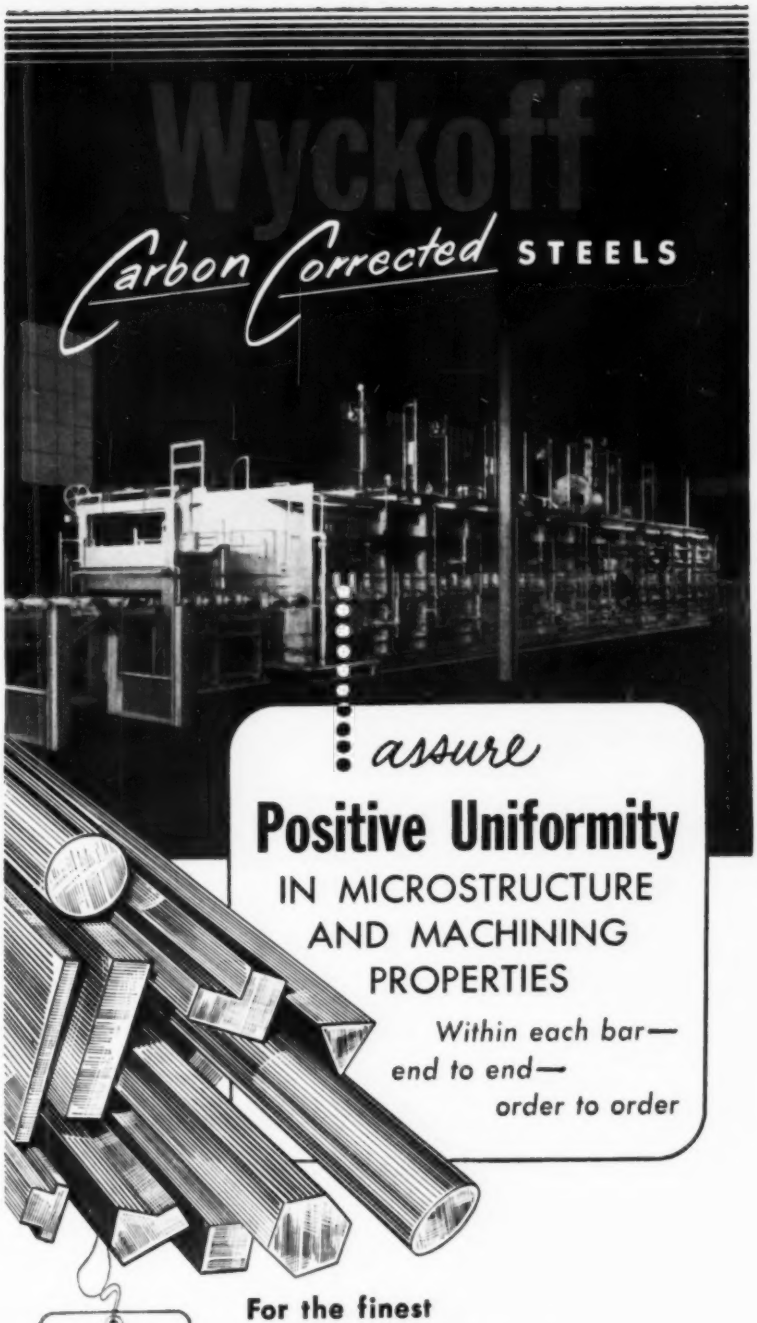
Micro-Stop countersink, designed for aircraft, missile, and other precision work, produces a final cut accurate to ±0.001 in. Cutting faces and pilots of all countersink cutters are ground simultaneously for perfect parallelism. They are available in five standard angles, in diameters from ⅜ to 1½ in.

Finger-tip adjustment for depth of cut is made by retracting the thimble and rotating to desired position. When thimble is released, serrations provide positive locking. Spring-loaded shaft assures alignment before cutting.

Schrillo Aero Tool Eng Co, 8715 Melrose Ave, Los Angeles 46, Calif.

MORE DATA? Circle 107, inside back cover

"Don't get excited! We're still on lunch break!"



For the finest in Cold Finished Steels— Specify Wyckoff!

WYCKOFF STEEL PRODUCTS • Carbon, Alloy and Leaded Steels • Turned and Polished Shafting • Turned and Ground Shafting • Large Squares • Wide Flats up to 12¾" x 2¼" and 14" x 1¼" • All types of Furnace Treated Steels including Carbon Corrected Steels

SPECIALISTS IN COLD FINISHED STEELS EXCLUSIVELY

WYCKOFF STEEL COMPANY

GENERAL OFFICES:
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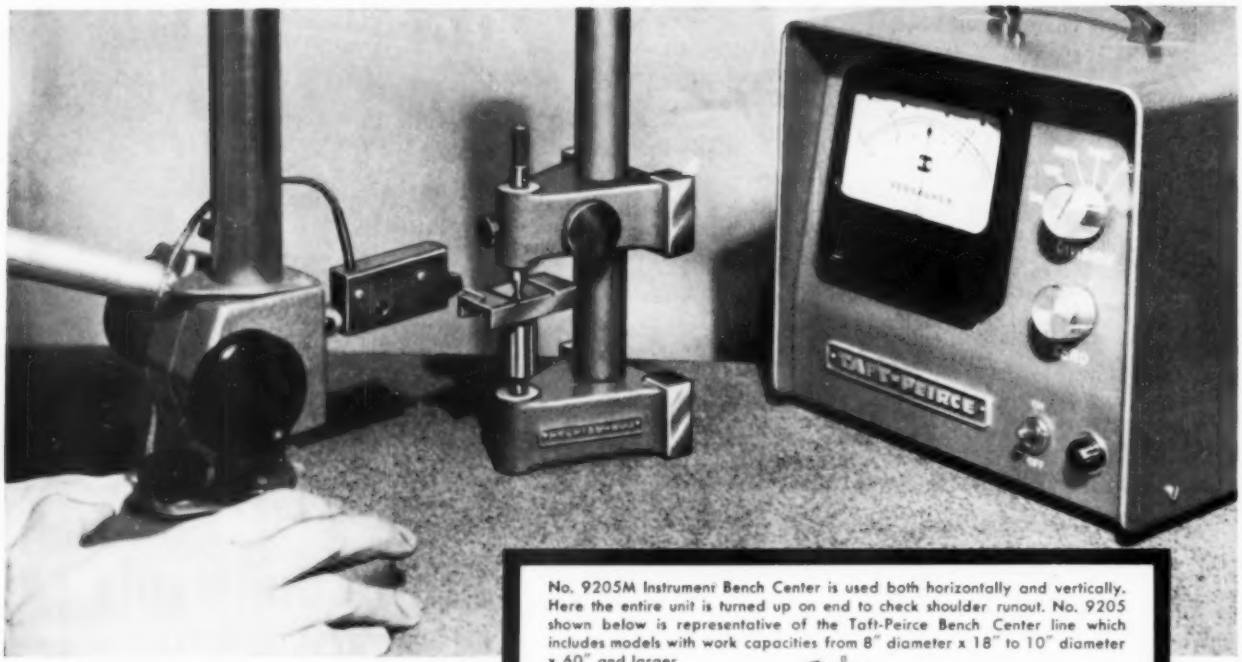
Branch Offices in Principal Cities
Works: Ambridge, Pa.—Chicago, Ill., Newark, N.J.—Putnam, Conn.

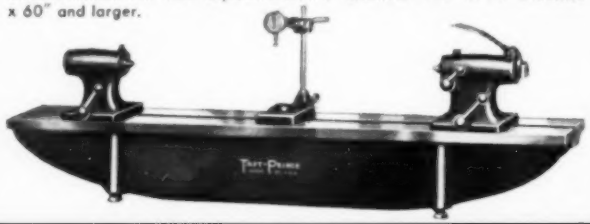
CIRCLE 295 READER SERVICE CARD

FROM THE TAFT-PEIRCE METALWORKING FAMILY . . .

Precision Tools that make it easier



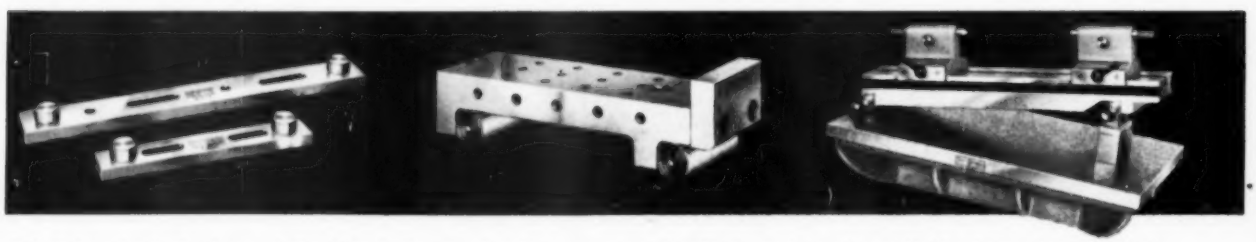
No. 9205M Instrument Bench Center is used both horizontally and vertically. Here the entire unit is turned up on end to check shoulder runout. No. 9205 shown below is representative of the Taft-Peirce Bench Center line which includes models with work capacities from 8" diameter x 18" to 10" diameter x 60" and larger.



Bench Centers allow fast, accurate inspection of parts and components

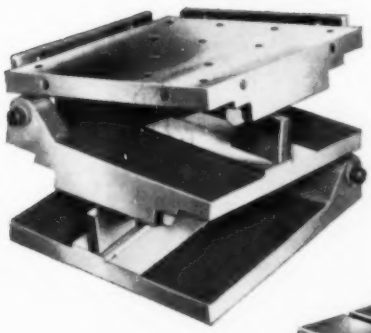
Taft-Peirce Bench Centers give you a fast and accurate method of inspecting work on arbors, mandrels or directly on centers.

Instrument Bench Centers are specifically designed for speed, accuracy, and versatility in checking miniature and sub-miniature parts. The Standard Bench Center Line offers a large number of headstock, tailstock, and bed combinations for handling work of practically any length and diameter; and special purpose attachments can be designed and manufactured. Bench Center beds are also available separately, for mounting shop dividing heads and similar inspection equipment.



Taft-Peirce Angle Setting and Checking Equipment. Sine Bars, Sine Blocks, and Taper Testing Fixtures are made with the precision needed to speed and simplify extremely accurate setting of angles . . . for layout, light machining, or inspection. **Sine Bars** provide maximum angle setting accuracy because of their close tolerances for bar flatness, squareness and parallelism, and button location. They are available in 5", 10" and 20" sizes. **Sine Blocks** are heavy duty workholding fixtures for angular work. Each block is equipped with a precision ground end plate and tapped holes on top and sides for convenient work mounting. In 5", 10" and 20" sizes. **Taper Testing Fixtures** are a real help for precise inspection of tapers machined on centers. They combine a special 10" or 20" Sine Block with movable head and tailstock. They also double as highly precise Bench Centers.

to produce Quality Products



Sine Angle Plates

Toolmaker's Adjustable Knee

Sine Angle Plates speed and simplify setting of a wide variety of angular work for machining and inspection. Top plates have end stops for positioning work and tapped holes for clamping. A precision ground .100" step in the base allows setting of small angles down to zero with standard gage blocks. Available for both simple and compound angle work.

Toolmaker's Adjustable Knee is valuable for fast setup of work for angular layout, machining, and inspection. The tilting work table swings to any angle and clamps firmly. Has graduated quadrant and vernier scale, and sine buttons for extremely fine settings.

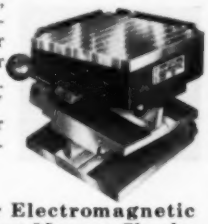
SEND FOR NEW CATALOG ON PRODUCTION AND INSPECTION EQUIPMENT... 34 pages of information on the complete Taft-Peirce line is included in Catalog No. 511, just released. Send for your copy, today.

A Complete Line of MAGNETIC CHUCKS

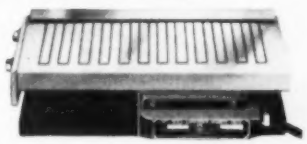
Taft-Peirce Superpower Magnetic Chucks provide many opportunities to lower production costs on an ever-increasing range of work. These are just some of the many types available in the Taft-Peirce line.

Rotary Electromagnetic Chucks pack maximum holding power in a small space to provide low-cost setups for flat rotary grinding. Ten standard sizes from 5⅛" to 30½" diameter. Magnetic Work Drivers are also available for centerless grinding setups.

Sine Angle Magnetic Chucks provide direct, positive work-holding, for compound or simple angles. Comes in 6" x 6" permanent or electromagnetic models.



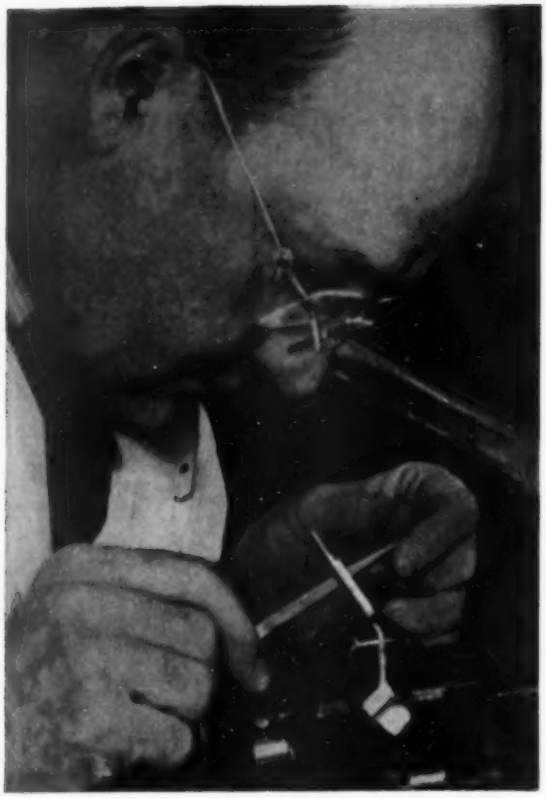
Superpower Electromagnetic and Permanent Magnet Chucks provide heavy magnetic flux concentration, permitting a greater variety of simplified setups for grinding, milling and light planing. Superior holding power assures safe and accurate machining.



Magnetic Chuck Bulletin No. 412 gives complete data and workholding ideas. Send for your copy.

TAKE IT TO TAFT-PEIRCE

13 MECHANIC AVENUE • WOONSOCKET, R.I.



Cut filing costs with files that increase filing skill

Time and labor—not the file—are the largest part of filing costs. But the file directly affects the time it takes to finish the job. The file is a hand tool—in effect, an extension of the man. If it reduces his skill, the work suffers and costs go up. If the file matches or increases his skill, he becomes more productive and costs go down. That's why more users choose *Nicholson, Black Diamond and X.F.* (Extra Fine) *Swiss Pattern files than any other. That's why file buyers and users* prefer *these brands over any others.*

X.F. Swiss Pattern Half Round file, one of more than 6000 Nicholson-made files that can cut your filing costs. We design our files to bring out the man's highest skill. He does his best work when he uses them. They are the most economical files you can buy. Your Industrial Distributor has a full selection. Call him for the Nicholson or Black Diamond file for your purpose.

NICHOLSON

NICHOLSON FILE COMPANY, PROVIDENCE 1, RHODE ISLAND

Files and Rotary Burs — Hacksaw and Bandsaw Blades
Ground Flat Stock — Industrial Hammers

Industrial Distributors provide the finest goods and services in the least possible time. Our products are sold exclusively through them.

Heavy-Duty Electric Impactool Introduced by Ingersoll-Rand

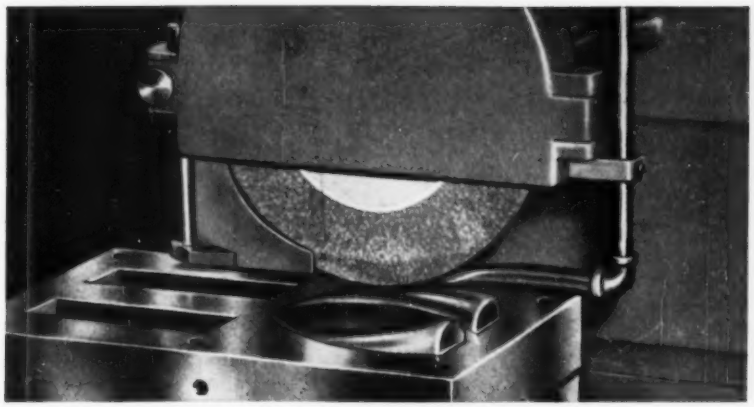
New ½-in. drive Model 5U-HD is said to deliver 25% more power than standard-duty ½-in. drive tools, and is lighter in weight. Compact T-type anvil is designed to improve efficiency of the impact mechanism; extra strong hammer case nose, and new, sturdy socket retaining pin in the square driver are built for rugged duty.

Unit is 10¼ in. in length, weighs 6 lb 4 oz, less cable. Side to center distance is 1-7/16 in. Tool delivers 1900 impacts per minute and runs at free speed of approx 1900 rpm. It is available for 110 or 220-v operation ac-dc (25-40-50-60 c). Although used primarily for nut running, it can be adapted with standard attachments for drilling, driving screws, reaming, tapping, wire brushing hole sawing.

Ingersoll-Rand Co, 11 Broadway, New York 4, NY

MORE DATA? Circle 108, inside back cover

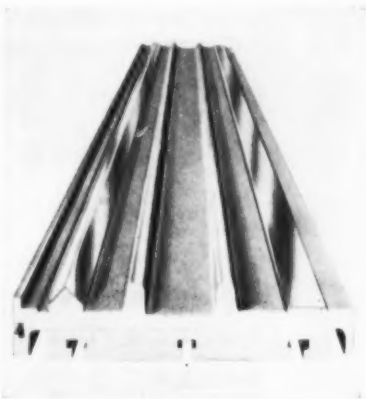
"What's wrong with you? Well, if you were a building, you'd be condemned!"



Micro-precision extended for years
ON EVERY COVEL TOOL-ROOM SURFACE GRINDER

Grinding plastic mold dies like this calls for MICRO-PRECISION . . . and the 14" x 24" Covel "60" has it! Also accurately grinds trim, forming, blanking and die-casting dies in addition to jigs, fixtures, dovetail and flat form tools. Ideal for high speed or carbide production parts grinding, too. Covel precision grinders save you money because they give new-machine performance longer—stay "front-and-center" in your tool-room grinder lineup for years and years of MICRO-PRECISION performance. That's because Covel-pioneered features preserve new-machine accuracy longer—for example, hard chrome table ways maintain built-in accuracy far beyond the life of ordinary ways. Before you buy your next surface grinder, it will pay you to learn all the facts about this and other Covel advances.

***First* with hard chrome table ways**

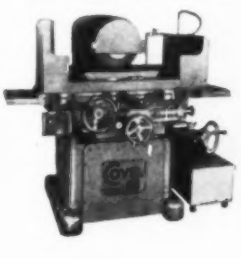


A special plating process developed by Covel applies a hard chrome surface to hand-scraped Vee and flat table ways insuring long-lived accuracy. Many Covel chrome plated ways have been in service for ten years and more without noticeable wear and without a sign of flaking.

Why Covel outperforms other tool-room surface grinders

Hydraulic rapid traverse with 15" cross feed, power elevation and high speed make the Covel "60" able to outperform machines costing much more. Elevating hand wheel is *below* table level and all controls are grouped for easy operation. Optional hydraulic wheel truing device automatically provides a truer grinding surface. *Write for catalog today.*

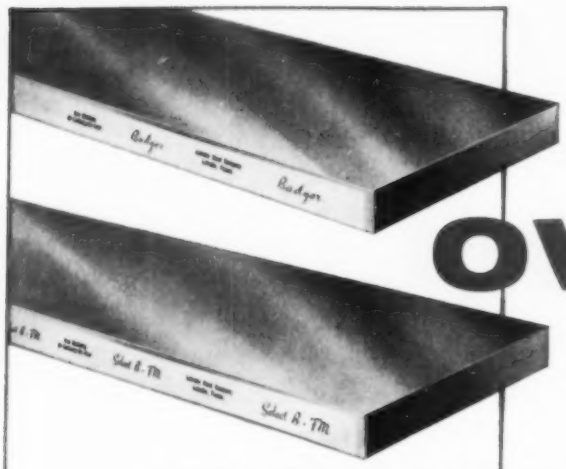
Micro-Precision a Covel Tradition-Since 1874



Send today for your copy of "The Covel Precision Story" and complete data on the Covel Surface Grinder that meets your needs — seven sizes from 6" x 12" to 16" x 36". Ask for Bulletin AM-129

COVEL PRECISION GRINDERS
BENTON HARBOR, MICHIGAN

CIRCLE 299 READER SERVICE CARD



Your need demanded it!

OVERSIZE

Flat Ground Die Stock

SELECT B FM A-2 Type Air Hardening

OVERSIZE: .010" to .012" on thickness

BADGER O-1 Type Oil Hardening

OVERSIZE: .014" to .016" on ¼" thickness and above
(Standard tolerances on 1 3/64" thickness and under)

Made by LATROBE

to cut your die costs!

Fully-uniform
DESEGATIZED®
SELECT B FM
(A-2 Type, Air Hardening)

•

BADGER
(O-1 Type, Oil Hardening)

Cuts die costs . . .
speeds die making!

Latrobe's OVERSIZE Flat Ground Die Stock facilitates die production by permitting design and layout to nominal dimensions—with "extra thousandths" for grinding to nominal size after heat treatment.

Latrobe's OVERSIZE Flat Ground Stock is furnished with precision-ground surfaces in 18 and 36 inch lengths. Grade is identified over entire length of bar. Over 750 sizes of O-1 type Badger and 125 sizes of A-2 type Select B FM!

Call Latrobe today—
Or, send for Bulletin P-8-9-243

LATROBE STEEL COMPANY

MAIN OFFICE and PLANT: **LATROBE, PENNSYLVANIA**

BRANCH OFFICES and WAREHOUSES: BOSTON • BUFFALO • CHICAGO • CLEVELAND • DAYTON
DETROIT • HARTFORD • INDIANAPOLIS • LOS ANGELES
MIAMI • MILWAUKEE • NEW YORK • PHILADELPHIA
PITTSBURGH • TOLEDO • SAN LEANDRO

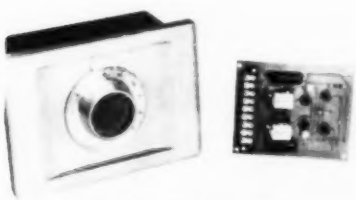
Tapping Attachment Operates At Speeds up to 2500 rpm

High-speed Tapmatic 300A incorporates an axial floating drive spindle and a supersensitive spring loaded ball clutch. Design eliminates friction clutches, planetary gears, leadscrews; an operator of minimum skill can produce consistently perfect threads without tap breakage.

Necessary driving torque is quickly adjusted prior to actual tapping operation and cannot be changed during the tapping job. Reversing torque is automatically increased or decreased when driving torque adjustments are made. Tap stops instantly when it becomes dull, loaded, or bottoms in blind hole operations. Model weighs 15 oz; diameter is 1-27/32 in.; length is 3¾ in. Rated capacity for mild steel is from No. 00 to No. 10-24.

Tapmatic Corp. 845 W 16 St, Costa Mesa, Calif

MORE DATA? Circle 109, inside back cover



Remote Positioner Features Low Cost, High Accuracy

Model D-52 Dialtrol is reported to provide highly accurate remote and automatic control at low cost for machine tools, variable speed drives, valves and pumps. Construction features include transistorized circuitry and printed circuit techniques.

The Dialtrol transmits the control signal to a shaft-mounted actuator which may be slipped on a control shaft in place of a standard hand wheel or lever. The command is set

How to Improve Production Rates and Quality

...with UNISORB 2-in-1 Machine Mounts

• SMOOTHER OPERATION AT HIGHER SPEEDS
• MAXIMUM VIBRATION CONTROL

Unisorb and Unisorb Level-Rite Mounts are used to control the "vibration personality" of different machine types and loadings, and make them operate more efficiently. See how these features can help you . . .

- Absorbs up to 85% of transmitted vibration
- Allows maximum operating speeds
- Improves quality, cuts rejects
- Maintains precise leveling
- Eliminates bolts and lag screws, no floor damage
- Saves from 30 to 75% — by actual report — in installation time
- Lowers noise level, improves worker morale
- Protects machines from vibration, preserves building, fewer replacement parts needed.

Try Unisorb on special trial offer! Send us description of one machine you would like to try on Unisorb. We will send correct type and density. If not satisfied, return pads and we will credit invoice. Available from leading Industrial Distributors; or write or call today.

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Please send me a Unisorb Sample and Consolidated Facts Bulletin.

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Want more information? Send for Unisorb Consolidated Facts Bulletin!

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Blaisdell markers do the trick

CHINA-MARKER

Unsurpassed for bold, bright marking on all surfaces. Strong and durable—adheres firmly—14 vivid colors.

OMNIMARK—Thinner diameter lead for fine line marking.

DU-ALL
MECHANICAL PENCIL

Convenient propel-repel action. 8 brilliant, all purpose leads with barrels to match.

AT BETTER STATIONERS EVERYWHERE

Test the marker that suits your needs. Send for sample naming this publication.

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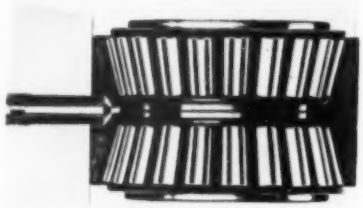
PENCIL COMPANY
BETHAYRES, PA.

on a dial (illustrated) or on a conter type setter. Automatic control may be provided by liquid level, dancer roll, pressure transducer or other signal device.

Price of the Dialtrol in quantities of 10 or more is less than $100.

Jordan Co, Inc, 3235 W Hampton Ave, Milwaukee 9, Wis

MORE DATA? Circle 110, inside back cover



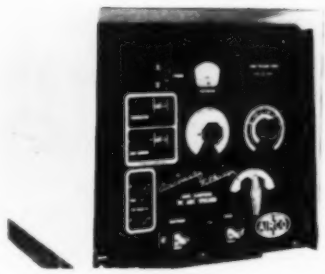
Line of Pin Type Double Cup Bearings Introduced By Timken

Line of Timken pin type double cup bearings is reported to have advantages over the conventional double cup bearing on applications where there is an inherent tendency for the outer race or cup to creep in the housing.

A hollow pin, located in the housing, fits into the large counter-sunk hole in the cup OD. Although the pin prevents the cup from turning in the housing, it does not restrict axial float, normally required as a result of shaft or housing expansion. With this design it is also possible to lubricate the center of the bearing directly through the pin.

Timken Roller Bearing Co, Canton, Ohio

MORE DATA? Circle 111, inside back cover



New Rectifier Welder Offered by Airco

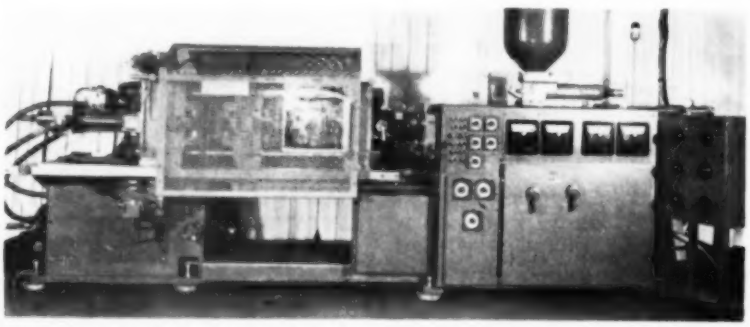
Aircomatic Fillerarc dc welder combines the features of a rising characteristic power source with the advantages of transformer-rectifier design. Specifically geared for use with Aircomatic (gas-shielded metal-arc) welding applications, unit is intended to supplement company's line of motor-generator machines. Suitable for both manual and automatic operations on all weldable metals, its primary advantage is stepless adjustment of arc length and rate of rise for various wire diameters.

Additional features include automatic maintenance of arc length, minimum burnback, ease of paralleling, cool operation, and independent adjustment of arc length and welding current. Primary line variation of ±10% will not adversely affect output.

Unit is rated at 450 amp, dc, 40 v, 100% of duty cycle. Weight is 665 lbs; height 28 in.; width, 25 in.; length, 46½ in. Design permits machines to be stacked or placed side by side for parallel operation in confined spaces.

Air Reduction Sales Co, 150 E 42nd St, New York 17, NY

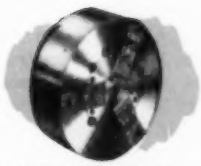
MORE DATA? Circle 112, inside back cover



INJECTION MOLDING MACHINE, Fellows No. 6-10-255, handles a wide variety of plastic products in the 6 to 10-oz size range. With standard 20-hp motor and 45 gpm pump, it dry cycles from 825 to 925 per hr with a shortened press stroke. Injection rate is 8.75 cu in. per sec. Machine handles mold bases up to 15 x 25 in. with max draw or stroke of 14 in. which is adjustable down to 8 in. Toggle-type press is hydraulically operated, has a mold locking pressure of 225 tons—*Fellows Gear Shaper Co, Springfield, Vt* MORE DATA? Circle 113, inside back cover

You'll get the job done faster at less cost with Skinner metalworking products

A complete line of hand chucks, power chucks, cylinders, vises

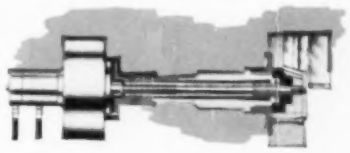


POWER CHUCKS

Provide positive gripping power. Assure accuracy within .001" on diameter on repetitive work. Available in self-centering, combination, serrated jaw, compensating, lightweight self-centering types and in sizes from 6" to 24" diameter. Mount directly on American Standard Type A-1, A-2, B-1 and B-2 flanged spindle noses.

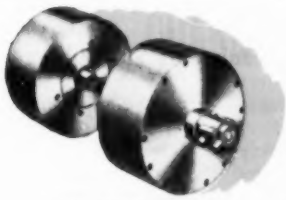
POWER CHUCK FIXTURES

Non-rotating. Hold work for drilling, milling, assembly operations. Air-operated for fast, effortless loading and unloading. In sizes from 5" to 24" with either two or three adjustable or non-adjustable jaws.



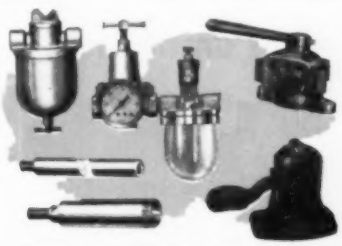
JUNIOR POWER CHUCKING UNIT

Designed to convert small lathes to high production power units. Case histories show users make worthwhile savings. Complete unit includes double-acting air cylinder, adapters, regulator, valve and self-centering chuck with 1/4" to 6" capacity. Components may be purchased separately.



AIR CYLINDERS

Double-acting, rotating operation. Speed production by opening or closing power chuck jaws almost instantly. Large ports assure fast action with minimum air expenditure. Standard sizes range from 4-1/2" to 20". Speeds up to 3500 RPM.



POWER CHUCKING ACCESSORIES

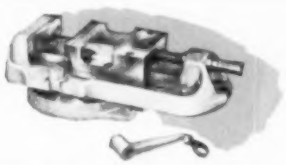
A complete line of power chucking accessories is available: Hand and foot operated valves, draw bars and tubes, air filters, complete air units.

+GF+ WORK DRIVERS

Fastest, surest way to drive 1/4" to 8-1/16" rough or smooth blanks between centers. Used instead of driving dogs. Mount on spindle of any lathe by means of adaptor plate. Engage and disengage workpieces quickly. Positively will not loosen. Have no protruding parts. Hood completely covers jaws. Drivers will work in either direction.

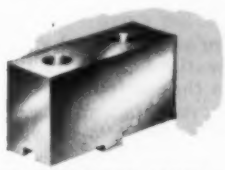
HAND-OPERATED CHUCKS

A large selection of Independent, Self-Centering and Combination chucks. Sizes suited to machines ranging from bench lathes to engine and turret lathes in sizes up to 36". Both direct mounting types and types for use with intermediate adaptor plates.



FULL CAPACITY TROUGH VISES SERIES F AND FS

A complete line of big capacity vises from 4" to 8". Available with or without swivel base. Opening capacity is equal to full width of jaws. Tremendous holding power for rough or finished work. Built-in trough returns coolant to machine table.



SOFT BLANK TOP JAWS

A complete line of medium and heavy duty blank jaws accurately machined to American Standard jaw dimensions. Jaws are low carbon alloy steel which can be carburized and heat-treated to the required hardness—available tongue and groove and serrated jaw types.

Skinner Products are sold through leading Industrial Distributors and Machine Tool Builders and Dealers.

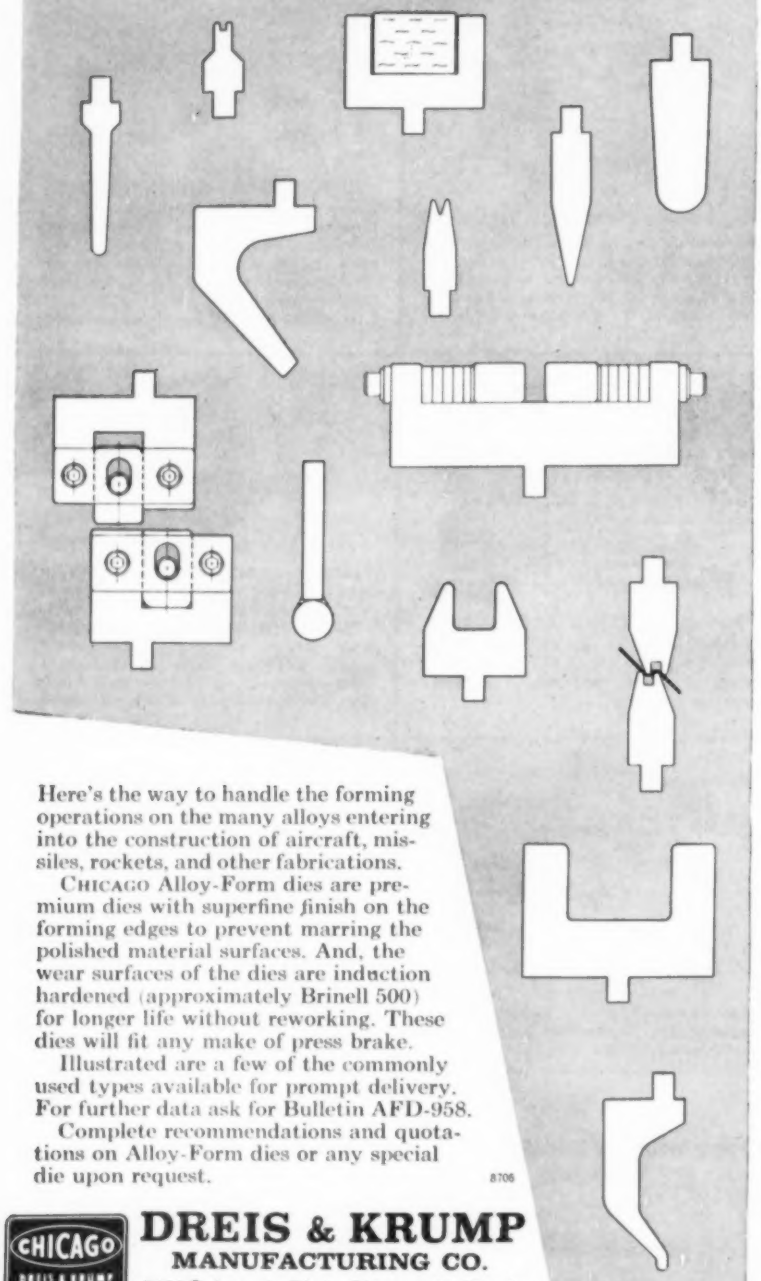
THE CREST OF QUALITY

SKINNER CHUCKS

ESTABLISHED 1887, NEW BRITAIN, CONNECTICUT

Alloy Forming for
AIRCRAFT
MISSILES
ROCKETS
and
OTHER FABRICATIONS

CHICAGO®
ALLOY-FORM DIES
For All Makes of Press Brakes



Here's the way to handle the forming operations on the many alloys entering into the construction of aircraft, missiles, rockets, and other fabrications.

CHICAGO Alloy-Form dies are premium dies with superfine finish on the forming edges to prevent marring the polished material surfaces. And, the wear surfaces of the dies are induction hardened (approximately Brinell 500) for longer life without reworking. These dies will fit any make of press brake.

Illustrated are a few of the commonly used types available for prompt delivery. For further data ask for Bulletin AFD-958.

Complete recommendations and quotations on Alloy-Form dies or any special die upon request.

8706

CHICAGO DREIS & KRUMP

DREIS & KRUMP
MANUFACTURING CO.
7434 S. Loomis Blvd., Chicago 36, Illinois

Press Brakes • Press Brake Dies • Straight-Side-Type Presses
Hand and Power Bending Brakes • Special Metal-Forming Machines

FIELD REPORT...

Avondale Marine Ways . . .

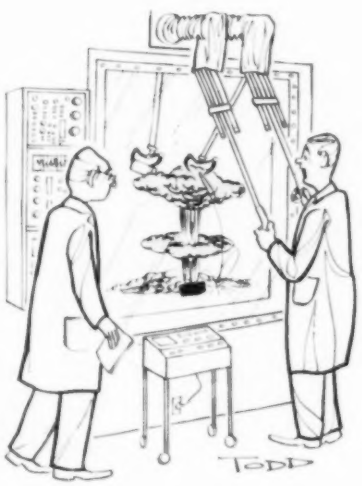
. . . New Orleans, has a contract from Delta Line for construction of three new freighters, with special cargo loading features, at a cost of $29.4 million. Vessels will be used by Delta between US Gulf Ports and the West Coast of Africa. Federal Maritime Board will pay a construction differential subsidy representing the difference between the Avondale bid of $9.8 million to build each ship and the estimated $5 million cost of constructing each vessel in Japanese shipyards.

Ford Plant Going on Two Turns

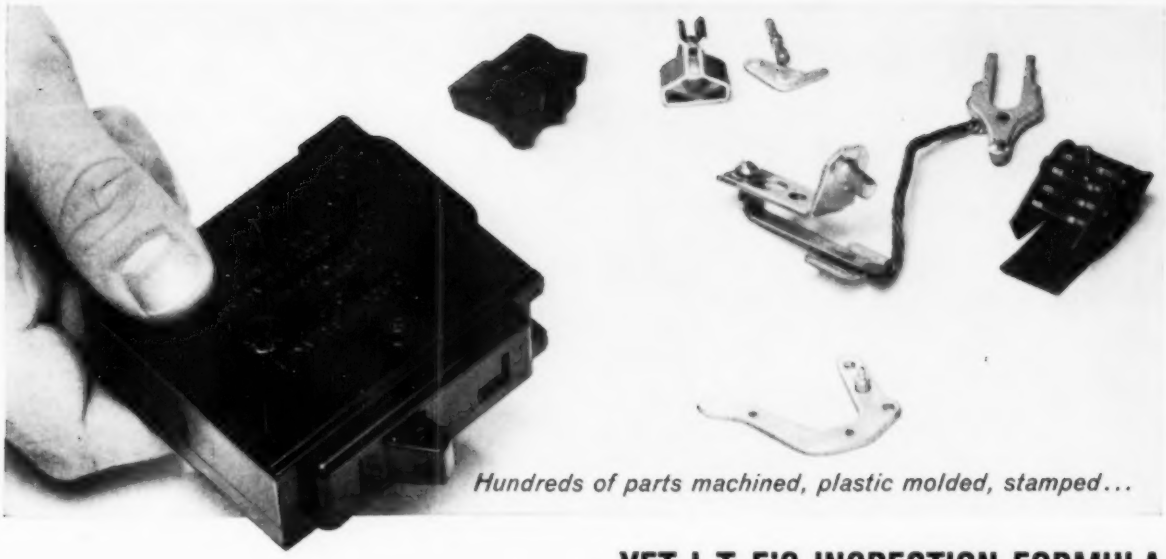
Ford Motor Co's Ford division plant at Kansas City will go on a double work turn July 13. About 800 employees will be added for the new second turn.

Canadair Gets $80 Million Order

Orders for 15 turboprop long-range freight airliners have been placed with Canadair, Ltd, a Canadian subsidiary of General Dynamics Corp, by two US air freight carriers. Flying Tiger Line has ordered 10 of the CL-44D-4's which are powered with four Rolls-Royce Tyne turbine engines, costing a total of $55 million including spare parts. Seaboard & Western Airlines has five on order, costing $25 million. Canadian plane has a swing-tail arrangement, permitting loading of cargo through the rear end of the fuselage. More than 32 tons of cargo can be unloaded in



"Gosh, I'm all thumbs today."



Hundreds of parts machined, plastic molded, stamped...

YET I-T-E'S INSPECTION FORMULA GUARANTEES PRECISION AS PRODUCTION RATES MULTIPLY!

Optical gaging inspects these tiny circuit breaker parts, in some cases seven times faster than hand methods. Permits more thorough, often more accurate, inspection of linear dimensions, hole diameters and locations, radii, angles and contours.

"We've found a practical method to retain precise quality in the many small parts we make to go into our circuit breakers," says the Small Air Circuit Breaker Division of I-T-E, in Philadelphia.

"That method makes *full* use of optical gaging with our Kodak Contour Projectors. They're in constant use to improve our quality and avoid production headaches at the same time.

"Starting in *receiving*, all components from our suppliers are optically checked to save later production snags. Tool and die samples and experimental parts in the *tool room* are optically checked. And finally, we inspect parts right in the *production* line. This way, inspection bottlenecks just don't happen."

Here are just a few reasons why I-T-E and other firms find inspection with a Kodak Contour Projector fast and accurate:

Parts and fixtures are easy to set up, even large parts.

You have a constant 8" of working space regardless of magnification.

You can easily see and check what you're inspecting because there's brilliant, uniform illumination over the entire screen area, and the image is always erect and unreversed—at any magnification you select.

To learn more about these and other features of the Kodak Contour Projector and how they can ease your inspection problems, write for the booklet, "Kodak Contour Projectors."

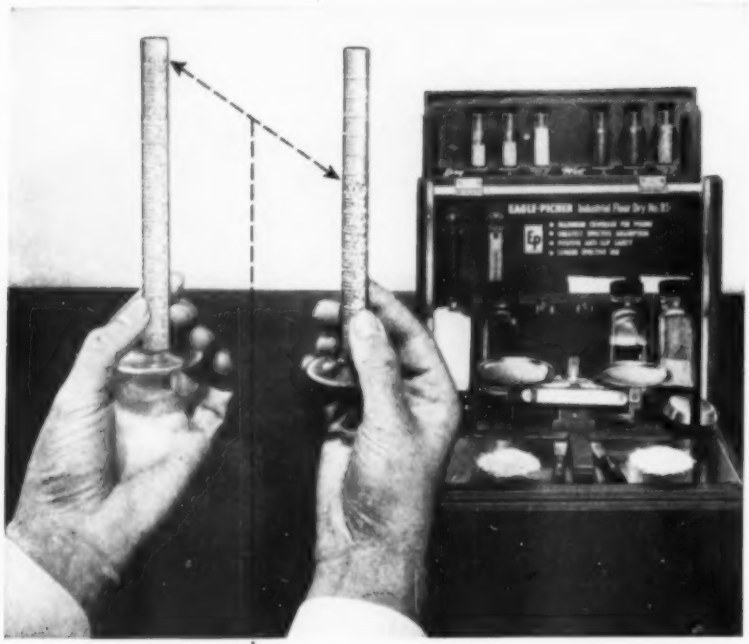
Special Product Sales

EASTMAN KODAK COMPANY, Rochester 4, N. Y.

the KODAK CONTOUR PROJECTOR

Kodak
TRADE MARK

CIRCLE 305 READER SERVICE CARD



There's a BIG difference in floor absorbents

TEST IT Yourself!

IN YOUR OWN OFFICE, make this simple 15-minute test. Compare Eagle-Picher Industrial Floor-Dry to any other floor absorbent.

HERE'S WHAT YOU'LL PROVE TO YOURSELF about safe, skid-proof Eagle-Picher Floor-Dry: It's extremely insoluble, absorbs more oil and water. It goes further, provides much greater coverage. It reflects more light, brightens the work area. It's non-combustible, has no chemical reaction. It lasts longer, saves you money!

Since 1843 EAGLE EP PICHER

WRITE TODAY. Our Eagle-Picher representative will bring the portable laboratory to your office where you may make this test yourself. The Eagle-Picher Company, Cincinnati 1, Ohio.

Field Report . . .

19 minutes, compared with "many hours" required to load conventional side-door air freighters carrying 12 to 20 tons. Direct operating costs are estimated to be the lowest for any air freighter yet built, averaging only about 3½¢ a ton mile. This would mean that, after including indirect costs, freight might be carried for as little as 10¢ a mile, or about half the present rates. First deliveries are expected in late 1960 or early 1961. Order marks the first time that Canadian-built planes have been sold to any US airline.

A-C Acquiring Tractomotive Corp

Allis-Chalmers will take over Tractomotive Corp, Deerfield, Ill, producer of the Tractoloader, sold through A-C construction machinery dealers worldwide. Company has been a major supplier of tractor attachments to A-C since it was founded in 1945. It'll become part of the A-C Construction Machinery Div and complement production at the Springfield, Ill, and Cedar Rapids, Iowa plants.

Two Basic Oxygen Furnaces . . .

. . . reported to be the largest in the world, will be constructed at the Cleveland Works of Jones & Laughlin Steel Corp. Program, estimated to cost approximately $50 million, will also include building of one of the

"So I tells him that if he can't give me more than union scale he can get a new boy!"

Helixform*—a new method for bevel gear production!

The new No. 112 Hypoid Helixform Gear Finisher assures improved quality and increased production on spiral bevel and hypoid non-generated ring gears up to 10½" in diameter, and 2½ DP such as employed in passenger car axles.

The Helixform Cutting Method used on this machine offers these advantages:

Conjugate tooth surfaces, minimized gear development, complete control of tooth bearing, and greater adjustability in final assembly.

We will be glad to send a bulletin giving further details on request. Ask for literature on the No. 112 Hypoid Helixform Gear Finisher and the companion No. 112 Hypoid Gear Rougher. Write for it today.

*Trade-Mark

GLEASON WORKS

1000 UNIVERSITY AVE., ROCHESTER 3, N.Y.

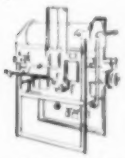
60-A

CIRCLE 307 READER SERVICE CARD

WILLIAM C. DIMAN,
Atmosphere Equipment Specialist, reports . . .

MODERN METALS DEMAND MODERN ATMOSPHERES

Ever since 1927, when Hayes perfected the first controlled-atmosphere furnace, we have made a steady effort to further the technology of protective atmosphere heat treating. By recommending proper atmosphere equipment, we have helped customers increase production, obtain uniform product quality, and save processing time and trouble. Today, our atmosphere generator line, probably the most comprehensive in the business, includes:



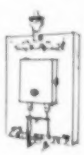
Exothermic Generators . . . for oxidizing or medium-reducing type atmospheres. Standard sizes from 200 CFH to 50,000 CFH.

Endothermic Generators — for reducing and carbon potential atmospheres. Standard sizes from 100 CFH to 20,000 CFH.

Ammonia Dissociators — for producing hydrogen-nitrogen atmospheres of high purity and low dew point. Standard sizes to 5,000 CFH, or multiples thereof.

Nitrogen Generators — for 99.99% pure inert gas at less than 20¢ per 1000 cu. ft. Standard sizes from 1,000 CFH to 10,000 CFH.

Forming Gas Generators — for producing controlled ratios of nitrogen and hydrogen from dissociated ammonia. Standard sizes 500 CFH, 1,000 CFH, and larger upon request.



Molecu-Dryer (with LINDE'S Molecular Sieves) — for drying, sweetening, purifying protective atmospheres down to dew points of minus 100° F. Standard sizes from 250 CFH to 6,000 CFH and larger on request.

Hayes offers more than just equipment. Our engineering organization and experimental lab are ready to help make sure you get a "Results Guaranteed" solution to your heat treating or protective atmosphere problem. Write for descriptive bulletins.

C. I. HAYES, INC.

Established 1905

837 WELLINGTON AVE. • CRANSTON 10, R. I.

ELECTRIC FURNACES

It pays to see HAYES for metallurgical guidance, laboratory facilities, furnaces, atmosphere generators, gas and fluid dryers.

Field Report . . .

largest blast furnaces in the US. New basic oxygen furnaces are expected to produce 160-ton-heats, will have a total annual rated capacity of 1.2 million tons. Blast furnace, a 110-ft-high unit, will have a diameter of 32 ft, and a working volume of 65,000 cu ft. It'll have a daily rated capacity of 2500 tons and will increase the yearly rated iron capacity at the Cleveland Works from 866,000 to 1.8 million tons.

Hupp Acquires Cutler-Hammer Div

Hupp Corp of Cleveland has bought the valve operator division of Cutler Hammer. Acquisition, an all-cash consideration including tools, fixtures, and inventory, is the second within two weeks. Company recently took over American Non-Gran Bronze Co, Berwyn, Penna. C-H division manufacturing operations will be moved from Milwaukee to the Chicago plant of the Hupp Aviation Co Div, which will be responsible for service of Cutler-Hammer valve operators now in service. Hupp-made product will be known as Electrodyne valve actuators.

Singer Opens New Plant

Singer Manufacturing Co has opened a new plant at Elizabethport, NJ, for production of household sewing machines and parts. In addition to extensive machinery for production of parts, new plant includes facilities for machining, finishing, assembly, inspection, packing, and shipping operations. The 180,000 sq-ft plant can employ 750 people working two shifts producing 5000 complete machines a week, plus an additional 5000 sets of parts for assembly at a Singer plant in Anderson, SC. An existing building, and machinery, were retained in setting up the new division; additional equipment costing in excess of $5 million was installed.

PRR to Buy 23,500 Cars

Pennsy will purchase 23,500 new and rebuilt freight cars this year, largest such program ever undertaken by one railroad over such a short period. Purchase, costing over $215 million will be taken care of in the form of debt or long term lease obligations. Such cash as is required will be made available from sale of scrap through dismantling old, wornout cars. PRR President James M Symes also reports that the railroad plans to buy more diesel locomotives costing about $10 million.

Republic Steel to Build $45 Million Hot Strip Mill

First major project of a $375 million four-year modernization and expansion program will be a new 56-in. hot strip mill at the Warren, Ohio, plant. It'll be designed for output of carbon steel, sheets and strip, also for numerous other types of sheets including special grades of stainless currently being developed for aircraft and missiles. Mill, expected to be operating by the latter part of next year, will have a capacity to roll 145,000 tons a month. To be housed in a building with 300,000 sq ft of floor space, the mill will permit steel to leave the last finishing area at speeds up to 2300 fpm.

Boeing Missile Employment Up

Although the general trend in Boeing Airplane Co's employment is down slightly from the 70,000 peak reached last year, employment in the Pilotless Aircraft Division is increasing. Total number of workers at the Boeing Missile Production Center, where the Bomarc is being manufactured, will increase from the present 4000 to 8500 by fall.

Lockheed Takes Over Electronics Firm

Lockheed Aircraft, Burbank, Calif, has recently been expanding its electronics activities. Most recent acquisition is Stavid Engineering, Inc, Plainfield, NJ, specialists in military electronics. Stavid Co was formed after WW II by Western Electric

"Total weight of machinery produced last month was 12 tons . . . 2 tons less than the paper-work your staff produced."

HERE IS *QUALITY* AT A SENSIBLE PRICE

the NEW CLEARING-HARRISON

11" MODEL JUST $1,950*

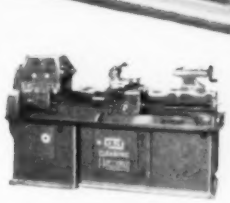
*Base Price F. O. B. Chicago, Los Angeles and New York

Not only does the Clearing-Harrison look like a lathe that should cost 50% more than its list price, it performs that way. And it will continue to perform year after year as only a fine machine tool built to uncompromisingly high standards of precision can.

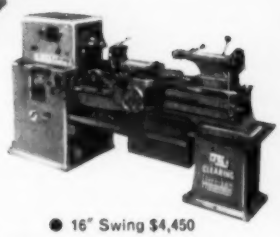
It has taper roller bearings in the spindle, hardened and ground ways, precision hobbed, heat treated nickel chrome gears. A removable section in the bed provides a gap giving a maximum swing of 18¾" on this 11" lathe. These and other fine features are found only in the Clearing-Harrison—sold and backed by Clearing division of U.S. Industries, Inc.

Delivery is immediate on this and on 13" and 16" lathes, too. Find out more about these and the many other benefits you get on the Clearing-Harrison. Write Clearing for details.

Clearing, division of U. S. Industries, Inc., also manufactures the Clearing-Axelson line of engine lathes, power presses of all types, dies and special tooling, and special equipment for the aircraft and missiles industry.



● 13" Swing $2,950



● 16" Swing $4,450

Also available with factory-built copying attachments.

Coast to Coast Service Facilities

Clearing's nationwide facilities assure you of prompt service always. Replacement parts and accessories are stocked at Clearing and are available through all three plants, at all service centers and through all Clearing dealers.

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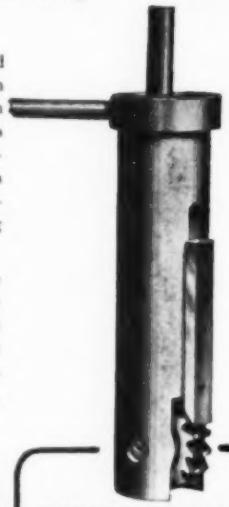
CIRCLE 309 READER SERVICE CARD

The INSIDE STORY about NATIONAL Keyseating Millers

NATIONAL Keyseating Millers are designed for milling internal keyseats . . . in one cut . . . in offset holes . . . with parallel sides . . . partly through holes . . . of standard width and depth . . . in holes that are closed at one end . . . and many other operations. A demountable guide on body of Miller enters keyseat being milled assuring straight keyseat in perfect alignment with the axis of the bore, thus making it unnecessary to clamp work to drill press table.

CUTTERS are made from high speed steel which are hardened to Rockwell specifications and accurately ground to size. Tops of teeth are staggered to break chips which reduces strain and wear on both cutter and driving pins. It will pay you to put National Keyseating Millers on the inside of your next keyseating job.



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CINCINNATI 22, OHIO

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for Catalog No. 17
complete, handy size

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FOR GREATER PRODUCTION • EFFICIENCY • SAVINGS

Use rugged, reliable "Hole Hog" machine tools for such jobs as:

- ★ Multi-Spindle Boring ★ Single and Multi-Spindle Honing
- ★ Straight Line Multi-Drilling ★ Adjustable Spindle Drilling
- ★ Vertical and Way-Type Fixed Center Drilling, Boring and Tapping
- ★ Special Multiple Operation Machine Tools

Twenty-Station, Ten-Unit Transfer Machine for boring, counterboring, chamfering and valve clearance operations on V-8 automotive engine blocks. (Shown)

Over 58 years of Machine Tool Engineering experience is at your service. Tell us your particular problem.

MOLINE TOOL COMPANY
100 20TH STREET • MOLINE, ILLINOIS
REPRESENTATIVES IN PRINCIPAL CITIES

Field Report . . .

engineers; last year it employed 1000, had sales of $11.7 million, a quadruple increase in the past five years. It supplies electronic systems, advanced missile technology, and instrumentation in the prime contract field for all three armed services and plans to broaden its activities in civilian fields.

Sperry Rand Unit Expanding

Sperry Phoenix Co, a Phoenix, Ariz, division of Sperry Rand Corp, is planning a $1 million expansion this year that'll double its present work force of 550. Construction will start next month on a 60,000 sq-ft addition to the existing 81,000 sq-ft facility which produces aircraft instruments and flight control systems.

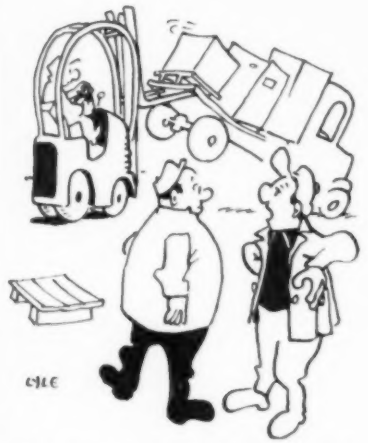
Chrysler's M-60 Tank Contract

Order for 180 of Defense Dept's 52-ton tanks amounts to $2.4 million. Work is being done at company's Newark, Del, plant. It's reported that tanks will be produced there in larger quantities soon.

34th Norelco X-Ray School . . .

. . . will be entirely devoted to the subject of X-ray spectrography. Sponsored by the Instruments Division of Philips Electronics, Inc, Mount Vernon, NY, sessions will be held at the Sir Francis Drake Hotel, San Francisco, during the week of August 31-September 4. Registration (no fee) for the course is open to those interested in rapid, accurate, non-destructive methods of analysis.

(continued on p203)



"You better give him a few tips on running the fork lift."

New C-800 easier to read, easier to use

Chrome Clad. Easy to read because jet black numbers stand out sharply against soft, nonglare chrome.

Wide-Open, Double-Length Vernier. Reading is unobstructed with wide-open vernier. Graduations are twice as far apart as on standard vernier scales.

Bar at Front. Bar is at front of base, gets closer to work. Permits machinist to read directly to zero.

Three-Point, Adjustable Gib. Gives uniform sliding action holds jaw parallel to base at any position on bar.

Always buy from your Lufkin distributor. He knows precision tools. His stock is maintained to fit your needs. He is always ready to give you prompt and reliable service.

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TAPES · RULES · PRECISION TOOLS

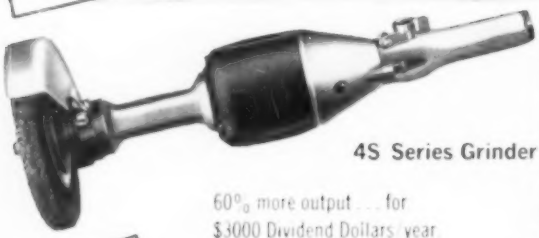
SAGINAW MICH. · MIDDLETOWN N.Y. · BARRIE ONT.

NEW SERIES IR GRINDERS

to give you an ANNUAL DIVIDEND on your PAYROLL DOLLARS

NEW *DESIGNS SPEEDS POWER*

NEW



4S Series Grinder

60% more output . . . for $3000 Dividend Dollars/year.

NEW

001 Series Grinder

25% more output . . . for $1250 Dividend Dollars/year.

NEW

42F Series Grinder

25% more output . . . for $1250 Dividend Dollars/year.

NEW

2G Series Grinder

17% more output . . . for $850 Dividend Dollars/year.

If your operators are using older model grinders, you can increase their man-hour productivity by as much as $3000 Payroll Dollars in one year, just by replacing the older tools with one of the new I-R designs.

Multiply these *Annual Dividends* by the number of grinder operators in your plant, and you can see why management today is taking a new look at portable tool operations.

There's a fast, easy way to calculate the amount of *Dividend on Payroll Dollars* these new I-R grinders can help you earn in just one year—without adding to your present payroll.

It's yours without obligation. To get it, call your I-R AIRengineer today. Or write Ingersoll-Rand, 11 Broadway, New York 4, N. Y.

Ingersoll-Rand

Tools plus AIRengineering increase output per man

8-923

Field Report . . .

Stokes to Market Blow Molder

F J Stokes Corp, Philadelphia has signed an agreement with Zimmerman Machinery Co, Stamford, Conn, to take over production and marketing of Zimmerman's manifold blow molding equipment, several units of which are already in service. Equipment is offered free of any royalty requirements.

Precious Metal Plating Plant

EverLube Corp, North Hollywood, Calif, manufacturer and compounder of dry film lubricants, has opened a new plating division that will specialize in quality plating applications in the precious metal field. It'll include gold, silver, electroless nickel, hard nickel, rhodium, cadmium, as well as copper.

Tyson Bearing Re-Expands

Second $1 million expansion project has been started at the Tyson Bearing Co plant at Massillon, Ohio. Company, a division of SKF Industries, completed a $1.2 million expansion in April. Scheduled for completion by Sept, combined projects will boost plant manufacturing area by more than 50%.

Metal Products Co . . .

. . . Nashville, Tenn, producer of steel stampings and metal fabrications, has purchased Goodin Iron Works (same city), whose products include ornamental iron, steel stairways, and handrails.

"We've had it cleaned, adjusted, and repaired. This time could you fix it?"

SOSSNER 3 exclusives

1. TST SOSSNER TRIPLE TEMPERED TAPS

Only SOSSNER Taps are tempered THREE TIMES. This results in a tougher, more reliable, longer lasting tap.

2. SOSSNER SPIRAL TAPS

A choice of 3 standard designs for wider application.

Regular
Hook
Three Flute

3. SOSSNER "elektraLUBE" SURFACE DEPOSIT

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Quality Controlled Since 1910

Since its founding in 1910, SOSSNER has earned an industry-wide reputation for high performance and reliability of product through adherence to a strict Quality Control Program. As an example . . . all SOSSNER Taps are subjected to final inspection procedures of 100% on critical dimensions, and 200% on thread size. SOSSNER stocks a complete line of standard taps in all sizes and styles. Custom or Special tap orders receive prompt, knowledgeable handling by our tap specialists.

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Inquiries from representatives and distributors are invited.
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They are made to provide smooth, more efficient transmission of power and are available from stock in 13 sizes with bored or solid hubs ranging from .375" to 4.000". Special bores, bores with keyways or setscrews are available upon special order.

The close limits to which all parts are held assure maximum load carrying capacity with durability and long life. All parts are made of preheat-treated alloy steel and are precision ground to insure high quality and interchangeability of components. Joints with hub diameters of .750" and larger have a self-closing snap ball oiler while the small pin is held in place with a self-locking snap ring. The snap ring simplifies assembly and disassembly.

Send today for Bulletin No. 527 describing the full line of ASG Universal Joints available from your nearest distributor.

AMERICAN STOCK GEAR DIVISION
PERFECTION GEAR COMPANY **HARVEY, ILLINOIS, U.S.A.**

Free Literature

To order any of these bulletins, circle corresponding number inside back cover.

MACHINES AND ATTACHMENTS

1 MULTIPRESSES — *Denison Engineering Division, American Brake Shoe Co, 1160 Dublin Rd, Columbus 16, Ohio.* 8-page bulletin covers Series A; discusses typical applications for these bench-type, 1 and 2-ton units. Dimensional data included; function and placement of major components illustrated. Section describes accessories, including benches, dial feeds, foil marking, electric foot switch control, positive stop, and die bolsters.

2 TAPE CONTROL POSITIONING—*Jones & Lamson Machine Co, Springfield, Vt.* 10-page brochure, Form LO-5902, describes advantages of method as well as illustrating various applications. Tells how retrofitting or do-it-yourself applications may be accomplished with packaged positioning units offered by J&L.

3 "THE 'HOLE' ISSUE ON HOLES" —*Drillmation Co, Inc, 6500 E Eleven Mile Rd, Center Line, Mich.* 10-page illustrated folder explains how and why precision tapping, drilling, and gun boring is being used to reduce the cost of ordinary metal cutting operations through utilization of Tapmation, Drillmation, and Boremation power units.

4 POWER SAW — *DoAll Co, Des Plaines, Ill.* 12-page brochure illustrates and describes cutoff capacity and operation of the Model C-24. Features include new chip disposal system, redesigned saw feed control mechanism reported to increase blade life 200 to 500%; improved drive system to supply adequate power for new accessories, and a redesigned coolant system. Unit has 24 x 24-in. sawing capacity, and power loading and runout conveyors controlled from a movable console.

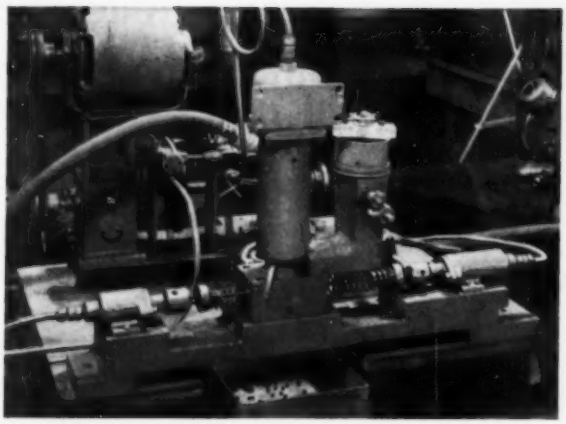
5 METAL CUTTING BANDSAWS—*W F Wells & Sons, Three Rivers, Mich.* 4-page cover folder with eight separate insert sheets contains illustrated descriptions of horizontal metal cutting bandsaws; each sheet provides complete information on individual models including applications, design features, dimensions, specifications,

"Is this going to be another one of those years when everything seems to go wrong with your work, again?"

***Progress** in designing air systems:*

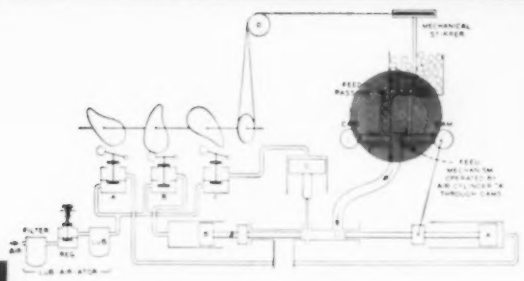
Here's another automating idea: Schrader Air Products in a multi-step punching system

PROBLEM: To pierce tiny balls of lead shot, fast, accurately, and economically.



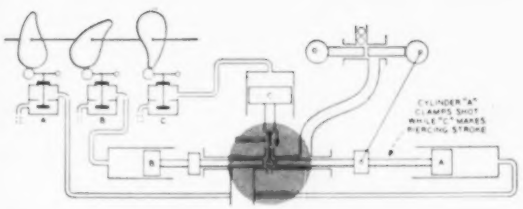
Schrader Products successfully performing at prominent Western plant—feeding, shot-piercing, ejecting—all automatically with air.

SOLUTION: Schrader Air Products designed into a system for automatic operation.



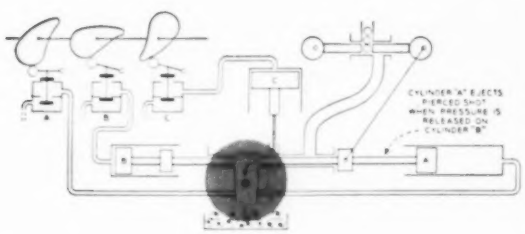
1

FEED: Performance of the cylinders in this system is controlled by cam-actuated Schrader valves. Cylinder A controls split-cam feed; allows the shot to be fed into the machine one at a time.



2

PIERCE: The shot is pushed forward and clamped at the piercing station by cylinder A and cylinder B. Cylinder C pierces the shot.



3

EJECT: Cylinder B returns to its initial position. Cylinder A completes its forward stroke, ejecting the pierced shot. And cycle starts again.

Air's benefits apply in almost any operation you can name: stamping, forming, programming, squeezing or measuring. And the advantages are more important today than ever: speed, accuracy, safety, simplicity, versatility, and—amazing economy. Schrader components are a natural for the designer because they comprise the only complete line of air products to select from. They can be used singly or in combination to perform jobs of amazing variety and complexity. When you design, think of air, and make use of Schrader's engineering facilities to help you specify the right products for your idea. Mail the coupon today.

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QUALITY AIR PRODUCTS

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460 Vanderbilt Avenue, Brooklyn 38, N. Y.

Please send latest informative booklets which show Schrader's complete line of Air Control Products.

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Now you can make substantial savings on precision bearings with guaranteed assurance of quality and performance. International KOYO bearings are produced under the most rigid quality control standards in the world. Backed by 40 years of know-how in serving a world-wide market, these are anti-friction bearings of *every type . . . every size . . .* and of *unequaled quality*. Manufactured under an exclusive patented forging process, these bearings are available in any degree of high precision.

A Product of American and Japanese Teamwork

Manufactured in Japan in one of the world's most modern bearing plants, International KOYO bearings are an outstanding example of American and Japanese teamwork. Millions of dollars in precision American machine tools are used in their manufacture. In addition, 95% of the iron ore used in the bearing steel is a product of the U. S.

If you are looking for *longer life . . . greater load capacity . . .* and *lower costs* in your bearings, investigate International KOYO — the *most complete line* of quality bearings in the world market!

FOR COMPLETE INFORMATION WRITE

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BALL & ROLLER BEARING CORP.
GENERAL OFFICES: 3123 Eastlake, Seattle 2, Washington

Free Literature

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accessories. Model capacities range from A-6 with 6 x 10-in. to T-40 with 40 x 40-in.

6 WIRE STRAIGHTENING AND CUTTING MACHINE—*Vaughn Machinery Co, Cuyahoga Falls, Ohio.* 8-page bulletin 751 pictures and describes the Motomatic, designed to deliver uniform lengths of straight, precision-cut wire at variable speeds up to 300 fpm. First model, No. 75 with ¾-in. capacity, in a projected line, is a 21 ft 6 in. unit.

7 GEAR SOUND TESTER—*National Broach & Machine Co, 5600 St Jean, Detroit 13, Mich.* 6-page illustrated brochure discusses character of gear sounds and interpretation, and types of gear noise. Describes construction and operation of Red Ring gear speeders and the automatic Model GSR sound tester for inspection of spur or helical external gears from ⅞ to 3-in. PD.

8 FLEXIBLE SHAFT MACHINES—*Foredom Electric Co, Bethel, Conn.* 6-page catalog 210 covers four basic machines, both wall and bench types, as well as selection of handpieces for grinding, deburring, drilling, finishing, polishing, lapping. Also described is the Flexade that converts standard drillpresses, electric drills, and motors into flexible shaft machines which can be operated at speeds from 1500 to 10,000 rpm.

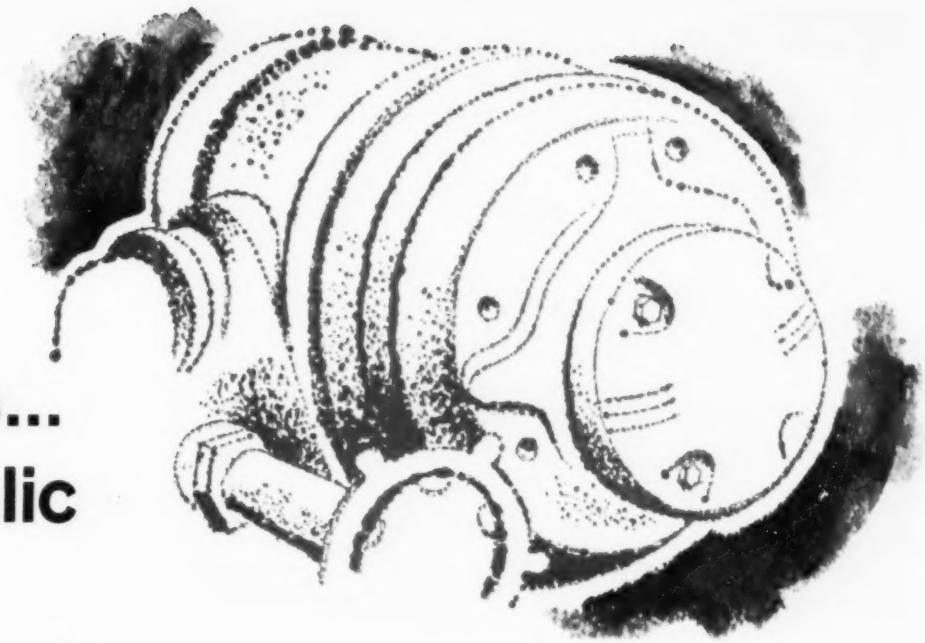
9 "SHOP GUIDE FOR ELEVATED-TEMPERATURE MAGNESIUM ALLOYS"—*Dow Chemical Co, Magnesium Products Sales Dept, Midland, Mich.* 28-page booklet describes recommended practices for working magnesium alloys of the thorium and rare earth metal families. Shop operations covered are machining (including chemical milling), forming, joining, assembly protection and finishing. Tables listing tool temperatures, bend radii, and various welding data are included.

TOOLS AND ACCESSORIES

10 AIR - OPERATED CHUCKING EQUIPMENT—*Cushman Chuck Co, Hartford 2, Conn.* 8-page bulletin PO-66D discusses advantages of systems. In addition to illustrations and complete listing of line of standard air chucks and cylinders, literature describes a typical application with detailed installation procedure.

(continued on p 208)

"You mean that's what this machine produces?"



Pumps... hydraulic oil... and profits

Faulty hydraulic pumps cut production. Rust, varnish and sludge interfere with precise control—in many cases bring a production line to a dead stop and whittle profits. Special inhibitors in Sinclair Duro Hydraulic Oils have earned the reputation for protection against varnish and sludge. Furthermore, Duro's rust inhibitor has a preferential metal-wetting action that forms a tough barrier against water penetration. Next time management asks how you've cut costs, tell them you've switched to Sinclair Duro...and show them the results.

Call your **Sinclair Representative** for further information, or write for free literature to Sinclair Refining Company, Technical Service Division, 600 Fifth Avenue, New York 20, N. Y.

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CIRCLE 318 READER SERVICE CARD

MAIN SHAFT FOR AUTOMATIC TRANSMISSION *is finished fast . . . at low cost on this Osborn Power Brushing setup. In seconds—two brushing heads, using Osborn Economyn wire brushes, oscillate back and forth and reverse direction to remove burrs and heat treat scale from splines at each end of the shaft. Brushing job is thorough and efficient to help assure troublefree shaft performance.*

IN SECONDS

with OSBORN Power Brushing

What's your production problem—higher volume . . . lower-cost output . . . better quality control? These are only *some* of the important basic problems you can easily solve—at low investment—with today's Osborn Power Brushing methods.

And you can *count* on the results—because over 67 years of experience means Osborn can engineer and apply the most efficient *power brushing techniques* for your specific jobs . . . your special problems.

The first step is an **O**sborn **B**rushing **A**nalysis. Here—your Osborn field engineer can single out immediate savings on your operations that involve deburring, cleaning, precision blending—or finishing methods of essentially every description. For details—write *The Osborn Manufacturing Company, Dept. C-85, Cleveland 14, Ohio.*

Osborn Brushes

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POWER, PAINT AND MAINTENANCE BRUSHES • BRUSHING METHODS
BRUSHING MACHINES • FOUNDRY PRODUCTION MACHINERY

Free Literature

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11 DRILLS—*Cogsdill Twist Drill Co, Greenfield, Mass.* 68-page catalog 359 provides information on center drills, combined drills and countersinks, counterbores, drill sets, screw extractors and sets, spotting and centering drills, twist drills. 44 pages of engineering data covers drilling procedure, reconditioning, speeds and feeds, jig drilling, and drilling of difficult-to-machine materials.

12 PRECISION HAND TOOLS—*Handicraft Tools, Inc, 48-41 Van Dam St, Long Island City 1, NY.* 12-page catalog describes and illustrates replaceable-blade X-acto knives; Lock-GriPlier for use in fine soldering, crimping, and positioning; and a variety of hand drill-pin vises, pliers, tweezers, chuck adapters, saws, and scraping and probing tools.

13 FLUORINATED COMPOUNDS — *Halocarbon Products Corp, 82 Burlews Court, Hackensack, NJ.* 12-page brochure gives data on range of waxes, oils, and greases characterized by chemical inertia, high thermal stability, good lubricity, high dielectric strength, high density, and non-polar properties. Applications include use as lubricants and in protective coating materials for liquid oxygen equipment, and as coolants for high power transmitting tubes and for transformers.

14 BLOCK-TYPE BORING TOOLS — *Giddings & Lewis Machine Tool Co, Davis Division, Fond du Lac, Wis.* 20-page catalog D-510 lists and describes applications of six interchangeable types of Davis blocks, including throwaway carbide insert type. Prices, specifications, and selection data cover blocks for boring and related operations for diameters from ¾ through 17 in. Prices and data also included on super HSS, solid carbide, and carbide-tipped cutters.

15 END MILLS—*Arrow Tool & Reamer Co, Troy, Mich.* Catalog 59 introduces several new styles and sizes of heavy-duty, ball, and other types. Product index classifies products by number of flutes for more convenient reference.

16 PORTABLE MAGNETIC INSPECTION UNIT—*Ferro Machine & Tool Corp, 5514 W Washington St, Indianapolis 41, Ind.* 4-page bulletin F-59 describes

"He makes it look easy. . ."

Lincoln

WELDYNAMICS

NEWS ABOUT ARC WELDING AT WORK CUTTING COSTS

Press frame is typical of fabrication done at Paterson-Leitch.

WELDING COST SURVEY SHOWS WAY TO BIG SAVINGS AT PATERSON-LEITCH

A cost reduction survey at The Paterson-Leitch Company of Cleveland, one of northern Ohio's largest steel warehouses and fabricators, indicated possible savings of almost $22,000 a year.

The survey made on two typical types of welds indicated that phenomenal savings could be realized by several simple procedural changes to eliminate over-welding, and by switching from DC to AC machines to achieve the best performance from the Jetweld iron-powder electrode being used.

P. L. Holden, a Lincoln welding engineer, spotted the difficulty on one of his regular visits to the plant—offered to make the survey and received the approval of Mr. L. M. Hardnack, Plant Superintendent.

Mr. Hardnack stated, "Because our work is so varied, it's hard to pin down costs on every operation. However, we have tried to follow Mr. Holden's recommendations, and I would be safe to say that we have realized at least 60% of the predicted benefits."

Lou Hardnack, Plant Superintendent, "We appreciate the professional engineering services of the Lincoln man."

For help with procedures and cost reduction ideas call your Lincoln welding engineer today.

NEW IDEALARC WELDER TAILORED TO YOUR NEEDS

The new Lincoln Idealarc "TM" welder has been designed to meet the needs of any shop.

The key to the "TM" model's versatility is a wide range of options that expand the applications for the machine.

Basically the Idealarc "TM" is a transformer type AC or AC/DC machine, depending upon the choice of the owner, with a moveable core reactor current control. Many new features have been built into the machine to improve welding characteristics, increase efficiency and to protect the machine.

Special features such as remote current control, remote selector switch control, ML-2 power pack, 115 volt push-button control, and others, are optional to adapt the machine to any welding requirement. Some of the options are available in kit form and can be installed in the field.

These new Idealarcs are available in 300, 400, 500 and 650 amp sizes.

Bulletin 4607.1 has all the details and specifications. A copy may be obtained by writing The Lincoln Electric Company.

THE LINCOLN ELECTRIC CO.

Dept. 2034 • Cleveland 17, Ohio

The World's Largest Manufacturer of Arc Welding Equipment

CIRCLE 320 READER SERVICE CARD

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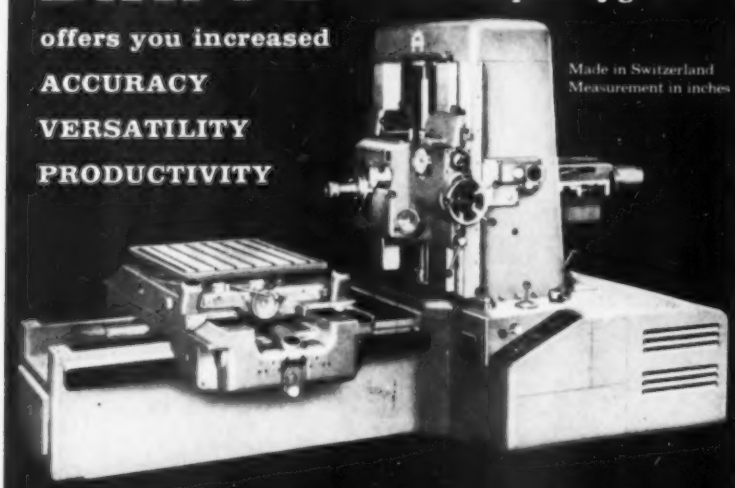
AUTOMATIC POSITIONING

with the

DIXI 75 horizontal optical jig borer

offers you increased
ACCURACY
VERSATILITY
PRODUCTIVITY



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Measurement in inches

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- Simplified controls functionally arranged for greater operating speed and efficiency
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- Hydraulic feeds and infinitely variable spindle speeds
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Feroflux method of locating invisible defects in ferrous metal parts and assemblies. System locates discontinuities such as subsurface cracks, laps, voids, as well as grinding, welding, and heat treating cracks, even through painted or plated surfaces.

17 DRAFTING EQUIPMENT—*Stacor Equipment Co, 295 Emmet St, Newark, NJ.* 24-page general catalog contains illustrated information on blueprint filing units; cabinets; drafting, drawing, and reference tables; staright edge and counterbalance; tracing equipment.

HEAT TREATING AND WELDING

18 PUSHER FURNACES—*C I Hayes, Inc, 810 Wellington Ave, Cranston 10, RI.* 4-page bulletin 5902 describes complete line of Type BA and BA-M units with ceramic heating elements for temperatures to 2600 F. 34 different furnace types are shown in a table listing open chamber, refractory muffle, and metallic muffle. Types of temperature controls, power regulators, and instrument panels available are illustrated and described.

19 PORTABLE SEMI-AUTOMATIC WELDING SYSTEM—*Reid-Avery Co, Dundalk, Baltimore 22, Md.* 6-page bulletin RD-400 presents illustrated information on the Raco Dynaweld system, a shielded arc welding process. Completely independent of water cooling and gas shielding, it lays down sound quality weld metal at the flick of the switch of the welding gun; it operates from any standard ac or dc power source. Specifications and applications included.

20 CRYOGENIC REFRIGERATORS—*Linde Co, Division of Union Carbide Corp, 30 E 42nd St, New York 17, NY.* 6-page folder F-1262 contains data on design and performance features of four types which utilize liquid nitrogen as the refrigerant, have no mechanical operating parts, and require no power source. Items such as metallurgical samples can be stored for indefinite periods of time at temperatures of −320 F.

(continued on p 212)

"I'm getting a charley-horse in my button-pushing finger so I'll have to go on sick leave. . ."

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Gage
Laboratory
Says

about **PIPE MACHINERY HILO SET PLUGS**

A well-known government gage laboratory recently reported on their study of our Hilo Thread Setting Plug Gages as follows:

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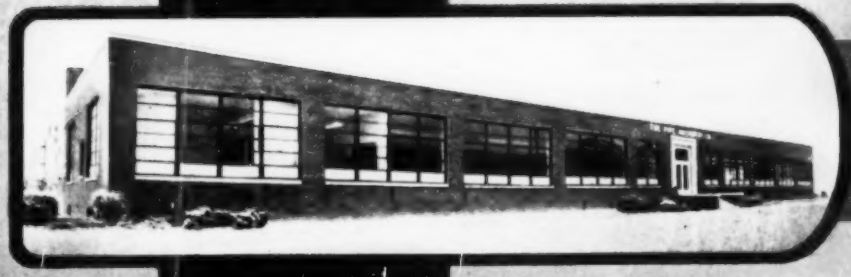

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50 1909-1959 years' leadership in industrial cleaning

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21 METAL CLEANING GUIDE—*Magnus Chemical Co, AM South Ave, Garwood, NJ.* Series of charts in file-folder form aid in selecting the correct cleaning method and chemical for removal of commonly encountered soils from a wide variety of metals. Covers typical problems involved in soak cleaning, steam gun cleaning, spray washing machine cleaning, and electrocleaning.

22 CHROMALLIZING — *Chromalloy Corp, 450 Tarrytown Rd, White Plains, NY.* 4-page illustrated folder describes 15 applications of the process for diffusing chromium and other elements into the surface of metal parts to increase their heat, wear, and corrosion resistance. Contains data on the process, various types of surfaces it produces.

23 HEAVY-DUTY FORK TRUCKS—*Elwell-Parker Electric Co, 4205 St Clair Ave, Cleveland 3, Ohio.* 6-page folder pictures and describes new Titan series, electric-powered units in capacities from 12,000 to 20,000 lbs. Includes detailed engineering information, dimensions, and specifications.

24 VACUUM METALLIZING SPRAY COATINGS—*Bee Chemical Co, Logo Division, 12933 S Stony Island Ave, Chicago 33, Ill.* 18-page booklet covers spray coatings for use in conjunction with metallizing thermoplastics, thermosetting plastics, metals, and glass. Base coats for use before metallizing, as well as top and backup coats for use after are described, together with information on the metallizing operation.

25 ELECTRONIC AIR CLEANER—*American Air Filter Co, Louisville 8, Ky.* 16-page bulletin 249-A illustrates and describes Model B Rollotron. Includes details of operation and electronic principle, explanation of the agglomerator and storage sections, equipment drawings, capacity and dimension tables, specifications, list of typical installations, and a description of the horizontal version of the Rollotron, known as Type H.

"He's trying to make a name for himself—S.O.B.!"

26 INDUSTRIAL FLOOR MAINTENANCE—*Oakite Products, Inc, 19 Rector St, New York 6, NY.* 9-page booklet F10593 presents illustrated information on how to clean and care for floors. Chart lists types of floors and cleaning compounds applicable. Describes cleaning and sanitizing methods, stripping wax and paint, and liquid absorption compound.

27 FLAT TOP CONVEYOR—*M-H Standard Corp, 513-521 Communipaw Ave, Jersey City 4, NJ.* Illustrated data sheet 1100 describes the Silent-Top for conveying small parts in a single line. Belt is available in both carbon steel and stainless in widths of 3¼, 4, 4½, 6, 7½ in. Drive is ¼, ½, ¾ hp standard units for any fixed speed or 2.7:1 variable speed between 10 and 200 fpm.

28 "MARKING AND SEALING SHIPMENTS MADE SIMPLE"—*Marsh Stencil Machine Co, Belleville, Ill.* 24-page illustrated catalog M-60 deals with how to stencil mark goods for safe delivery; how to save 25% on sealing cartons with gummed tape; proper kind of ink to use for all kinds of marking; three ways to stencil—brush, roller, spray; conversion tables for weights and measures; export marking data; a scale for measuring in inches and centimeters is included.

PARTS AND MATERIALS

29 GEAR AND FLUID DRIVES—*Link Belt Co, Dept PR, Prudential Plaza, Chicago 1, Ill.* 48-page book 2747 provides information on extensive line of standardized Gearmotors, Motogears, and Fluid Drives. Describes functions of these various types, provides detailed selection data, dimensions, overhung load ratings and mountings; lists such accessories as couplings, backstops, and slide rails.

30 PLASTICS — *Cadillac Plastic & Chemical Co, 15111 Second Ave, Detroit 3, Mich.* 64-page catalog and price list covers plastic sheets, rods, tubes, films, blocks, and flat tubings. Lists available sizes, weights, color ranges, textures, purchasing specifications, grades. Includes 2-page comparison table of chemical, electrical, and mechanical properties.

31 SPROCKETS AND ROLLER CHAINS—*Cullman Wheel Co, 1544 Altgeld St, Chicago 14, Ill.* 88-page illustrated catalog 60 contains details on 1300 different stock sprockets and various types of roller chains. Technical data and chain drive engineering information included.

32 PRESSURE SWITCHES—*Barksdale Valves, 5125 Alcoa Ave, Los Angeles 58, Calif.* 36-page design handbook and catalog PS-59-60 illustrates and describes Meletron units, diaphragm, bourdon tube, or piston. Contains detailed information on electrical and operating characteristics, comprehensive ordering chart, adjustment instructions, spare parts table, parts blow-up of each model, and a dimension diagram. Includes glossary of terms, selection chart, electrical rating tables, functional schematic symbols, trouble-shooting and maintenance checklist.

33 SILICONE RUBBER—*General Electric Co, Silicone Products Dept, Waterford, NY.* 8-page illustrated brochure CDS-191 gives data on use of RTV (room temperature vulcanizing) silicone rubber for plastic tooling and plastic model making operations. Typical sequence of operations required in preparing and applying RTV flexible mold material is pictured.

34 BRASS NUTS—*Cornell Manufacturing Co, 21B Saw Mill River Rd, Yonkers, NY.* 12-page brochure illustrates line of precision machined-from-the-bar nuts that meet American Class 2 as well as Class 2B and 3B tolerances. Includes engineering specifications on machine screw

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Your Bunting distributor now has in stock 138 sizes of 13" tubular and solid Bunting Bearing Aluminum Bars. Write or ask for catalog and literature.

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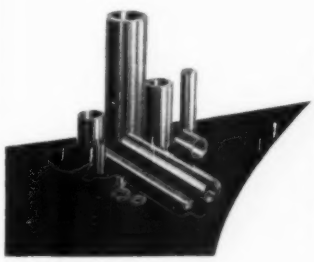
Your Bunting distributor is listed in the classified section of your telephone directory usually under Bars — Bronze and Bearings — Bronze.



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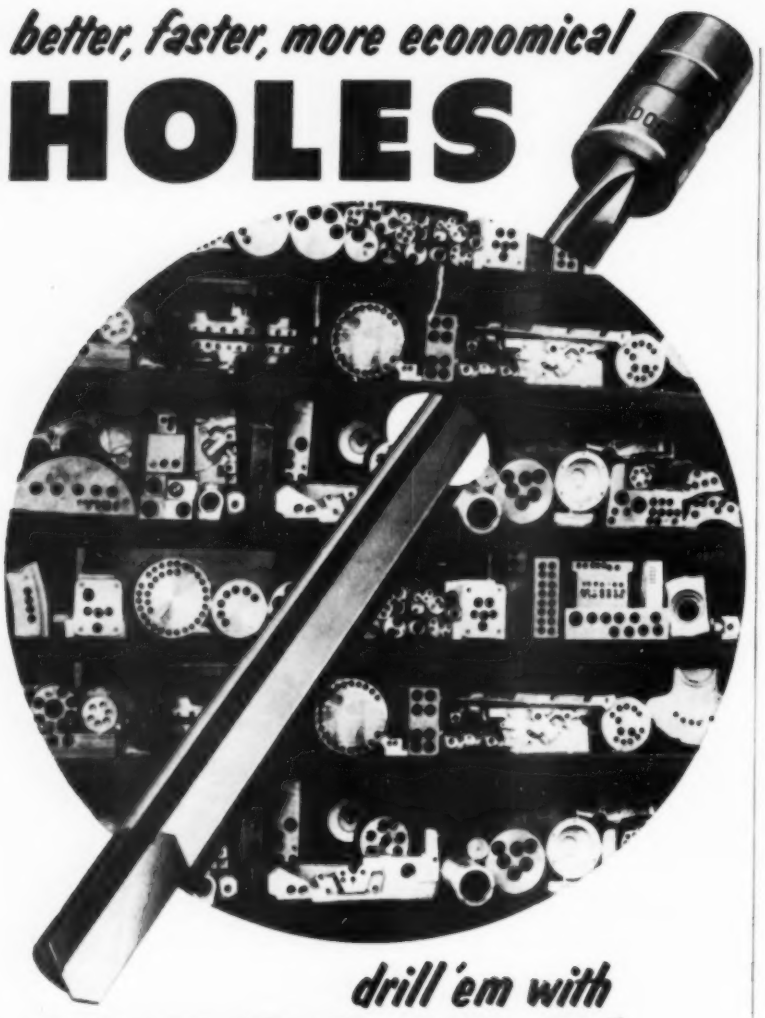

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Sizes	.1250 to 2" dia.	*Sizes*	1/8" to 1/2" dia. (in 32nds)
Lengths	less than 1 to 300 dia.	*Lengths*	OA 10", 16", 22", 28", 36"
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nuts, AS hexagon nuts, cap and open cap, knurled thumb, battery and spark plug nuts.

35 LIMIT SWITCHES—*National Acme Co, 170 E 131st St, Cleveland 8, Ohio.* 16-page illustrated bulletin EM-5912 describes complete new line of heavy-duty water and oiltight Snap-Lock units. Designated Series D-1200X-D200X, these switches are available in standard, neutral position, short travel, and push lever models; all are of single pole, double break, double-throw design. Fold-out sheets list specifications, current ratings, and mounting styles on the front side, and parts list on the reverse side.

36 SELF-ALIGNING ROLLER BEARINGS—*Chain Belt Co, Shafer Bearing Division, Milwaukee 1, Wis.* Condensed catalog 59A provides information on design, specifications, lubrication, seals, and installation features.

37 WELDED STEEL TUBING—*Formed Steel Tube Institute, 850 Hanna Bldg, Cleveland 15, Ohio.* 12-page brochure covering welded carbon and stainless tubing discusses advantages; lists size ranges available; illustrates applications; pictures standard joining methods.

38 SHEAVES—*Allis-Chalmers Manufacturing Co, Milwaukee 1, Wis.* Data sheet 20B9125 gives information on Adjustex sheaves available in all popular PD sizes and a new C section size, the 7.5/9.7. Sheaves are made in 2, 3, and 4 grooves for use with A, B, or C section belts. Dimensions table included.

39 DC MAGNETIC BRAKES—*Electric Controller & Mfg Co, Division of Square D Co, 4500 Lee Rd, Cleveland 28, Ohio.* 4-page illustrated bulletin 5000 describes construction features of Type WB brakes available in six sizes to cover the complete range of 600-series motors. Pictures maintenance procedures, provides selection charts for matching brakes to specific motors.

40 MILL SHAPES OF PENTON RESIN—*Polymer Corp of Penna, 2140 Fairmont Ave, Reading, Penna.* 4-page illustrated folder discusses Penton Resin, a new thermoplastic introduced by Hercules Powder Co. Describes availabil-

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Advanced Design Features in a Control Center . . .

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CONTROL CENTERS

. . . offer tops in
FLEXIBILITY · SAFETY
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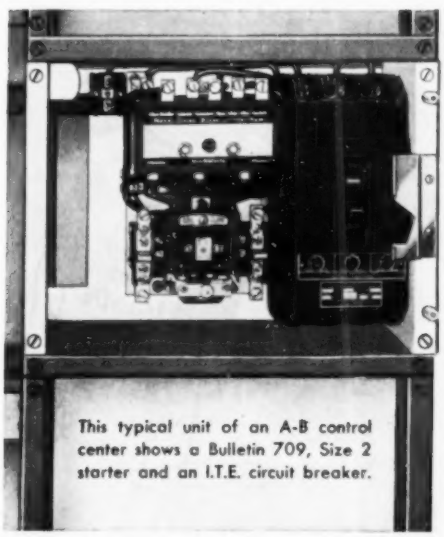

This typical unit of an A-B control center shows a Bulletin 709, Size 2 starter and an I.T.E. circuit breaker.

Allen-Bradley control centers are the "label" of a modern plant. They make neat, centralized installations and—where this is practical—do away with individual starter mountings and complicated wiring. The control center may even reduce installation cost—as compared with using individual starters. Here are some of the up-to-date design features which make the A-B control centers so popular.

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FLEXIBILITY—A-B control centers are readily adaptable to changes in operating needs—integral plug-in units can be added or modified without internal rewiring. Entire sections are easily added as needed.

SUPERIOR PERFORMANCE—Using the popular A-B solenoid starter—with only ONE moving part—assures millions of trouble free operations. Their double break, silver alloy contacts *never* need servicing.

For "tops" in control centers, you owe it to yourself to investigate Allen-Bradley's Bulletin 798. Write for complete information.

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ities including rod, strip, tubing, tubular bar, plate, tank linings, pipe, special castings, fabricated parts, and coatings. Suggested uses are presented; physical, electrical, and chemical property charts are included.

41 ADJUSTABLE SPEED DRIVES—*Cleveland Machine Controls, Inc, 1155 Brookpark Rd, Cleveland 9, Ohio.* Condensed specifications bulletin provides data on new line available in three series, 1/6 to 10 hp; speed ranges, 100:1.

42 FLUSH SEATING PRESSURE PLUGS—*Standard Pressed Steel Co, Box 875, Jenkintown, Penna.* 4-page bulletin 2501 describes Levl-Seal units designed for flush-seating to within half a pitch in hydraulic, pneumatic, or other high-pressure systems. Specification information, including recommendations on tapping and seating torques for steel and aluminum applications, is contained in tables and charts. Plugs are available in range of sizes from 1/16 to 1¼ in.

43 STAINLESS STEEL TUBING—*Superior Tube Co, 1568 Germantown Ave, Norristown, Penna.* 4-sheet Special Analysis Memo 120 gives technical data on small tubing drawn from PH 15-7 Mo, a precipitation-hardening stainless steel with outstanding mechanical properties at elevated temperatures. In addition to discussion of advantages, memo lists the chemical composition, applications, size limits, and standard heat treatments. Suggested applications include aircraft structural parts, instrument parts, and high-pressure hydraulic lines.

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AIR FRICTION CLUTCH? MECHANICAL CLUTCH?
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Don't settle for "second-best" when the best may cost you less! Chances are whatever your needs in an inclinable, it's a Bliss standard—simply because Bliss makes more types and sizes of inclinable presses than any other builder. In fact, someone else's "special" may be a Bliss standard. Check it out for yourself before you buy—write for our most recent inclinable catalogs and data sheets. You'll see that size for size, no matter what you want in an inclinable, you get more press from Bliss ... large crankpins, long strokes, greater openings, bigger beds and many other extra values. A press that's backed by a century of press engineering ... by competent counsel ... by a **dependable** parts and service program. In short, you'd be wise to check Bliss—**first!**

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EXTRA RUGGED... SPEEDY... ACCURATE...

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No. 1-14
32" x 9" table ... 14" table travel ... hydraulic table feed ... full automatic cycle.

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20" table travel... 42" x 12" table... fully automatic hydraulic table feed.

No. 2-20DS
Double Spindle for two milling operations at same time... 20" table travel ... 42" x 12" table.

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20" table travel... vertical spindle with speed range 32 to 1284 R.P.M. ... 42" x 12" table.

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STEP UP SPEED and ACCURACY!

Put the work on Kent-Owens Machines for top-speed milling and topmost accuracy to keep your costs at a minimum! Advanced features throughout make the difference ... greater dependability ... accuracy maintained. Twin-post head mounting assures balanced load. Greater cutting efficiency—only two gear contacts, motor to spindle. Write for bulletin #757 on wide range of hydraulic and hand-operated machines. Let us quote on proper machine complete with tooling for your operation. Also, call on Kent-Owens for special machines. Kent-Owens Machine Co., Toledo, Ohio.

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H H Whitmore (left) has been elected executive vice president of Jones & Lamson Machine Company, Springfield, Vt. **J C Hebert** (center) has been named vice president, and **R S Jones** is new general manager

NAMES IN THE NEWS...

Ervin F Borisch, executive vice president of Milwaukee Gear Co, has been elected president of the company to succeed his father **Emil G Borisch,** named board chairman. **E Jack Borisch,** assistant to the president, succeeds his father as executive vice president.

W E Rowe has been named vice president, manufacturing, of Long Manufacturing Division, Borg-Warner Corp, Detroit. He has been serving as director of manufacturing for all Long Plants in Detroit. **Daniel W Lysett,** director of sales for Long, has been appointed vice president, sales.

Paul A Miller has been appointed general manager of the Reliance Division (industrial fasteners) of Eaton Manufacturing Co, Massillon, Ohio. He succeeds **C A Sellen,** named to head the division's expanded steel sales program. Mr Miller was formerly general manufacturing manager of the Hardware and Accessories Division of Ford Motor Co at Rawsonville, Mich.

Hershel C Osborn, vice president and plant manager of Interstate Drop Forge Co, Milwaukee, has been named senior vice president. **Stanley J Renton,** superintendent, has been appointed vice president and plant manager.

George R Brockway, formerly vice president of the Rapids-Standard Co, has been named president of Vacu-U-Lift Co, Salem, Ill, division of the Siegler Corp.

Charles Peterson has been appointed chief engineer of Veet Industries, East Detroit machine tool manufacturer. Prior to joining the company Mr Peterson was associated with Futurmill, Inc.

John C Owens has been appointed manager of Fisher Body's new assembly plant at Ypsilanti, Mich. He was formerly manager of the assembly plant in Janesville, Wis. **Guy J Bates** has been named manager of the plant in Grand Blanc, Mich. Formerly manager of the metal stamping plant in Cleveland, he succeeds **R J Lystra,** promoted to executive assistant to the general factory manager, fabricating, in Warren, Mich.

James V Crawford has been appointed chief engineer of the Garrett Corp's AiResearch Manufacturing Division in Los Angeles. He was formerly engineering manager. **Dr Helmut Schelp,** assistant chief engineer, turbomachinery, in the Phoenix Manufacturing Division, has been appointed chief engineer there.

Charles M Evans (left), manufacturing manager of Brown & Sharpe Mfg Co's Machine Tool Division, will join the company's subsidiary, Brown & Sharpe Limited, Plymouth, England. He will assist Willard Spence in the general management of the British branch. **Duncan H Doolittle,** superintendent of the Milling and Grinding Machine Group, takes over Mr Evans' former post in Providence, RI. **A Dean Hunter,** superintendent of the Screw Machine Group, has been named superintendent of the Machine Tool Division

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Assures You Precision to the Finest Degree to Meet Your Requirements —Backed by the Name Supreme in the World of Measurement

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(JOHANSSON) and accessories. Short deliveries. Inspection and reconditioning service available at our plant.

INTERNAL INDICATORS

(for inside measurements .155 to 24 inches). Scale range plus or minus .001 graduated to .0001 and minus .020 graduated to .0001.

MIKROKATOR

(Amplifier—for outside measurements) Graduations .0001 to .000001 or .01M to .0002M.

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Micrometers, Snap Gages, Extensometers, Dynamometers, Hardness Testers, Surface Finish Indicators, Interferometers, Plugs, Rings and Special Gages.

C E J MIKROKATOR 502-E

Mikrokator No. 502-E is a precision instrument for dimensional measurements.

It is provided with a mechanical, frictionless amplification device without sliding bearings or gears and there is no play, wear or binding.

The purpose of the instrument is to give accurate measurements both in mass production checking and in checking individual parts.

The instrument is made in three different designs and in both inch and millimeter.

Cat. No.	Range	Graduated	Shaft Diameter
502-E-2	.016	.0002	3/8"
502-E-4	.004	.00005	3/8"
502-E-5	.002	.00002	3/8"
502-E-6	.0012	.00001	3/8"

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Most people like to compare their own performance with the championship record. Sometimes you feel better, sometimes worse. But at least the comparison tells how you are doing.

This is the kind of comparison you can make for your production equipment with the **American Machinist Inventory of Metalworking Equipment.** Listed in 96 pages are 167 types of equipment, 16 major industrial groups, 25 geographical areas.

Compare your plant with competition, with local plants, with the nation as a whole. A copy of the Inventory costs but $2.00 and may be secured by writing Reader Service Department, American Machinist, 330 West 42nd Street, New York 36, N. Y.

NAMES IN THE NEWS . . .

P Willard Crane (top), director of research at Cincinnati Milling Machine Co, has been elected a vice president. **Richard A Didday,** who has recently returned from managing the company's plant in Holland, has also been named a vice president

Edward W Hollis, general sales manager of Lewis Welding & Engineering Corp, Cleveland, has, in addition, been elected a vice president of the company.

Thomas V Jones has been elected president of Northrop Corp, Beverly Hills, Calif. Formerly a senior vice president, he succeeds **Whitley C Collins** who died May 12.

A J Verax, director of purchasing of Avco's Crosley Division, has been made manager of the Cincinnati plant.

John C Trent has been named manager of industrial engineering at the Dodge Assembly Plant, Detroit.

Andrew B Pulliam has been appointed president and general manager of the Marvel-Schebler Products Division of Borg-Warner Corp, Chicago. Formerly vice president and general manager, he succeeds **R C Ingersoll,**

NOW 7* STANDARD LAPMASTERS

FOR PRECISION LAPPING

to a flatness of .0000116" or less with a micro-inch finish of 2 to 3 RMS. All Lapmasters will maintain this uniform accuracy piece-after-piece because conditioning rings continually condition the lap plate during entire lapping cycle.

IN SMALL LOTS OR THOUSANDS PER DAY

with consistent accuracy. Production is not interrupted or slowed down for replacing or reconditioning lap plates.

OF PARTS UP TO 32" DIA.

and as small as ⅛" dia. Accurately laps paper-thin pieces as well as giant two-ton parts.

OF ANY SHAPE, FORM OR MATERIAL

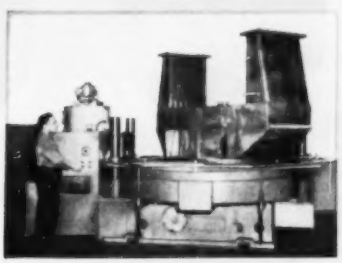
tall or squat, long or short, flat or odd shaped . . . any metal, ceramics or plastic all at the same time if necessary. Inexpensive work holders eliminate danger of stresses and warping usually caused by clamping during grinding or milling.

**For your special lapping requirements, we will build Lapmasters any size.*

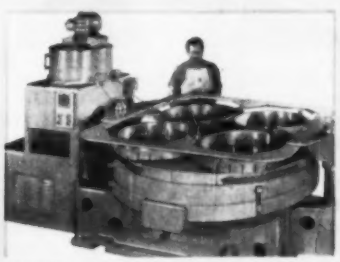
MODEL 10 for maintenance lapping of parts up to 3-11/16" dia.

MODEL 12 for parts up to 4" dia.

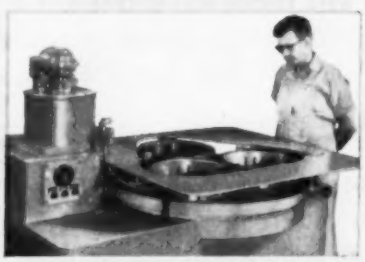
MODEL 24 for parts up to 9½" dia.



MODEL 84 for parts up to 32" dia.



MODEL 72 for parts up to 27" dia.



MODEL 36 for parts up to 13¾" dia.

WRITE FOR THE COMPLETE LAPMASTER STORY

Write for bulletins describing the Lapmaster line and chart on measuring flatness.

MODEL 48 for parts up to 17" dia.

Lapmaster® . . . THE MACHINE THAT PUT PRECISION LAPPING ON A PRODUCTION BASIS

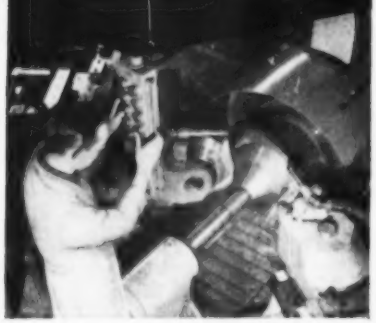
A product of

Crane Packing Company

6436 OAKTON STREET • MORTON GROVE, ILLINOIS (Chicago Suburb)

In Canada: Crane Packing Company, Ltd., Hamilton, Ont.

let Ingersoll HYDROSPIN your parts



If the shape of your part is tubular, conical, hemispherical, or curvilinear, hydrospinning by the Ingersoll Kalamazoo Division may save you costly machining expense and time. If you want a seamless part, try hydrospinning. If you want precise wall thickness, turn to hydrospinning. Hydrospinning saves on metal, time and labor.

COMPLETE PRODUCTION FACILITIES

Ingersoll Kalamazoo Division has an experienced engineering staff, and complete hydrospinning equipment. If you have a metal forming problem where hydrospinning may be of help to you, send an outline of your problem or contact the Defense Sales Dept. of

Borg-Warner Corporation

ENGINEERING B-W PRODUCTION

INGERSOLL KALAMAZOO DIVISION

1810 N. Pitcher St. • Kalamazoo, Michigan

NAMES IN THE NEWS . . .

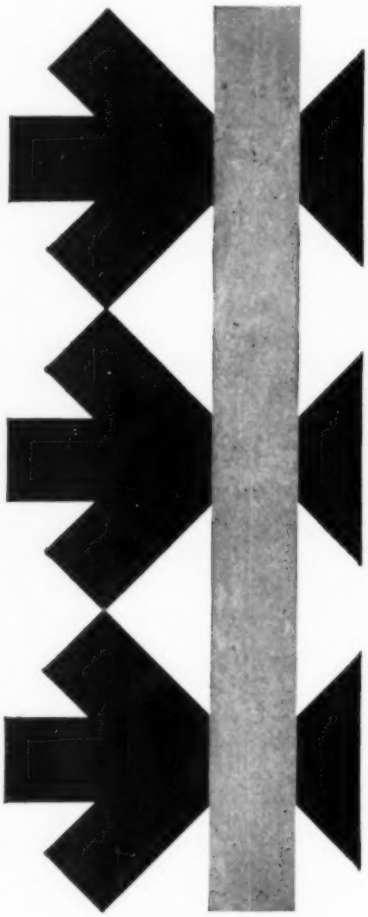
chairman of Borg-Warner, who is giving up his duties with Marvel Schebler in order to devote more time to company-wide responsibilities.

H Glenn Bixby (top) has been elected president of Bryant Chucking Grinder Co, Springfield, Vt. He succeeds **J H Beardsley** who has resigned. Bryant is a subsidiary of Ex-Cell-O Corp, Detroit, of which Mr Bixby is president. **N A Leyds** (bottom), associated with Bryant for the past six years, has been named vice president and general manager of the company

Charles E Trout has been named product manager for Graphite electrical brushes, United States Graphite Co, Division of the Wickes Corp, Saginaw, Mich. Also named product managers: **Jack C Schubert,** Graphitar; **Richard B Thomson,** Gramix; and **R H Amberger,** Mexican Graphite. The four men were previously sales engineers.

Robert E Hebert, a metallurgist at Vanadium-Alloys Steel Co, Latrobe, Penna, has been named manager of the new Vacuum Melting Department. **C J Stalnaker** has been appointed product metallurgist in the department.

V&O LONG SLIDE PRESSES



STILL the most inherently accurate inclinables you can buy—and so the most logical for mechanized or automated operations.

Emhart Manufacturing Co.
Hudson, New York
V & O Presses and Feeds

EMHART

CIRCLE 334 READER SERVICE CARD

CIRCLE 335 READER SERVICE CARD

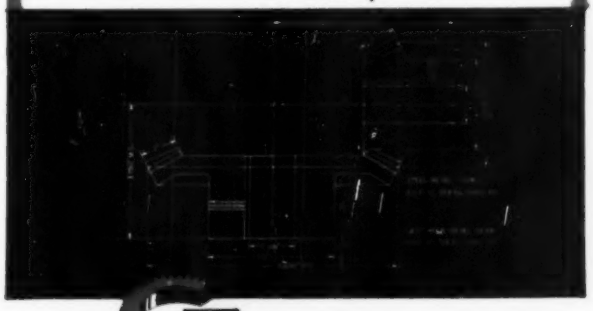
Gregory Grant says —

COMPARE THE COSTS!

BUY GRANT *Customized* GEARS FOR O.E.M. AND SAVE 25%

Here is a typical comparison — 50 sets of gears and pinions to meet assembly specifications:

Set of stock gears unaltered	$20.20	Set of Grant customized gears to your specifications, ready for installation
Rebore shaft hole /per pr.	.80	
Cut keyway /per pr.	.50	
Drill and tap for set screw /per pr.	.40	
	$21.90 pair	$15.75 pair



Yes, you can save 25% in actual costs when you specify Grant customized gears instead of making time-consuming alterations to fit stock gears to your needs. Layout, scheduling and machine time are eliminated, plus hidden costs for paperwork, handling and spoilage.

In addition to cost savings Grant customized gears save you time because they are ready for immediate assembly; rigid inspection prior to shipment makes certain that all gears are uniformly accurate to insure maximum dependability and eliminate rejects.

For all original equipment applications, you will be dollars ahead when you specify Grant customized gears. Send us your specifications for an immediate quotation – no obligation of course.

ESTABLISHED IN 1877

GRANT GEAR WORKS, INC. WEST SECOND STREET, BOSTON 27, MASS.

• *Catalog Available on Customized Gears* • *Precision Gears* • *Speed Reducers*

CIRCLE 336 READER SERVICE CARD

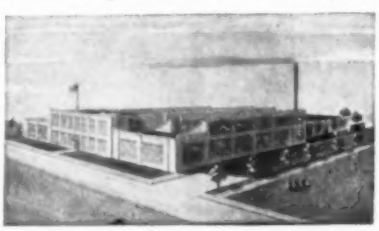
CDT can help you cut costs

CDT CAN INCREASE YOUR PRODUCTION
. . . because CDT specializes in designing and building tools and machines for today's high production demands.

CDT CAN IMPROVE YOUR QUALITY
. . . because CDT tools, jigs, fixtures and machines are precision engineered and built to the strictest requirements.

CDT CAN LOWER YOUR PRODUCTION COSTS
. . . by increasing the efficiency of your operation with special tools that do the job better—faster—more economically.

Call on Columbus Die-Tool for your special tooling problems. A large creative engineering staff with experience in developing special tools and machines for hundreds of industries is at your service. Over 50,000 square feet filled with precision production equipment enables us to build fine tools and special purpose machines to exacting requirements. Avail yourself of the industry-wide experience of Columbus Die-Tool.



FREE: *New brochure listing facilities, equipment, etc. Write today.*

Columbus Die-Tool
AND MACHINE COMPANY
P.O. BOX 750 • COLUMBUS, OHIO
ESTABLISHED 1906

Designers and manufacturers of JIGS • FIXTURES • SPECIAL TOOLS • UNITS FOR MACHINE TOOLS • *also Builders of Machine Tools Complete*

NAMES IN THE NEWS . . .

Graham E Marx, president and general manager of the G A Gray Co, Cincinnati, has been named chief executive officer of the company, succeeding **August Marx**, now chairman of the board

James T McFadzean has been appointed assistant sales manager of the Butterfield Division of Union Twist Drill Co at Derby Line, Vt, and Rock Island, Quebec. He has been serving as manufacturing superintendent of the Rock Island plant

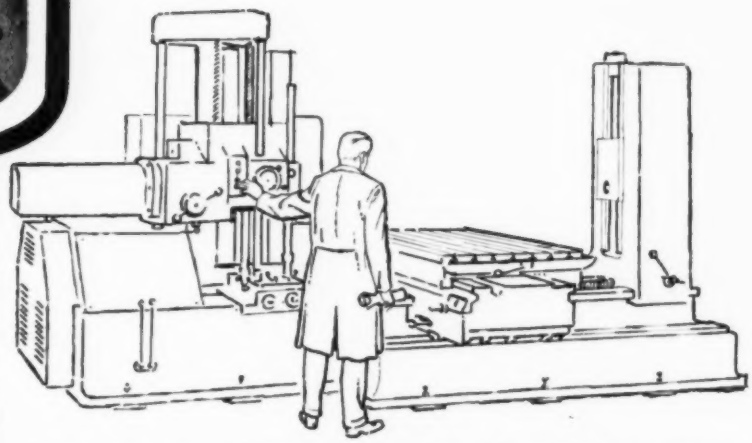
John W Daughters has been named sales manager of the Cincinnati Gilbert Machine Tool Co, Cincinnati. He was previously field engineer for the company

whatever the **machine tool application . . .** you can depend on **CUNO** engineered filtration

CUNO Filters are vital to the efficient operation of machine tool lubrication, hydraulic, and coolant systems. By removing damaging particles, they help reduce maintenance and replacement costs by protecting bearings, gears, valves, pumps, controls, etc. . . . help improve the quality of the product being manufactured.

Depending upon the specific application, CUNO offers you three basic filter types . . . CUNO Positive Self-Cleaning Edge-Type, CUNO Automatic Self-Cleaning Wire Wound Type, CUNO Disposable Depth Cartridge Filter . . . available in a variety of housings to meet *any* flow requirement.

Whenever *you* have a filtration problem—involving either a built-in application or a centralized system—write us. Our engineers will welcome the opportunity to demonstrate how you can *depend on* CUNO.

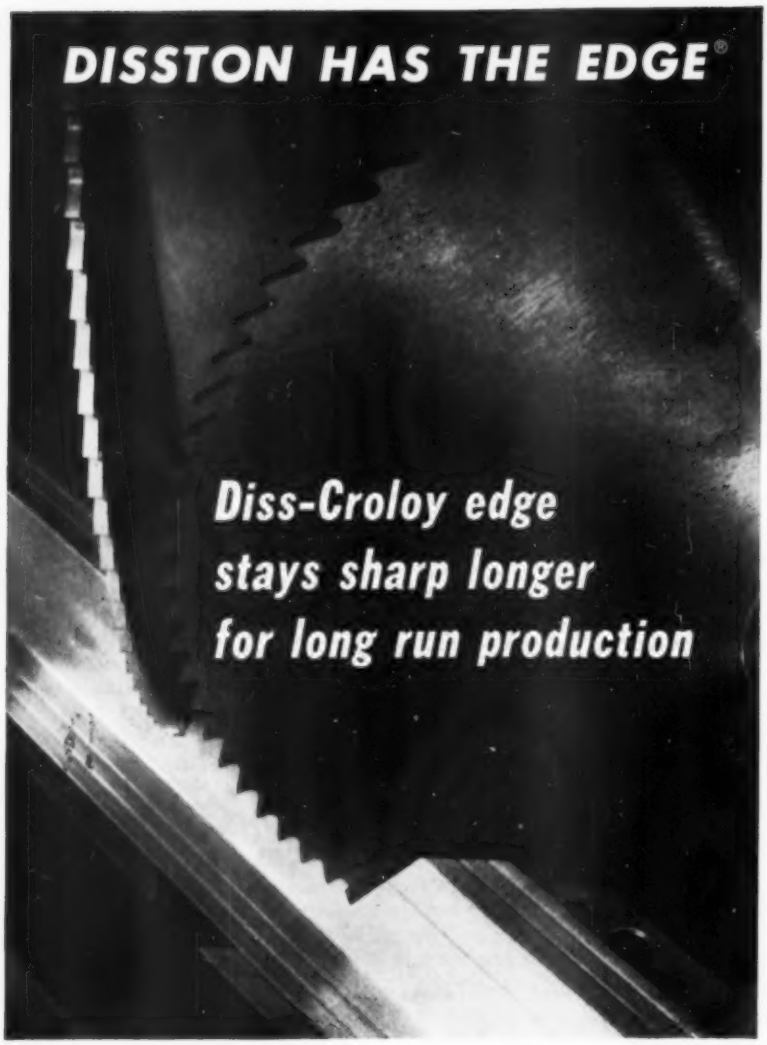


THE CUNO ENGINEERING CORP., Dept. 10, MERIDEN, CONN.

A Leader in Industrial Filtration for More Than 30 Years

In Canada: Peacock Bros., Ltd., P. O. Box 1040, Montreal 3, P.Q.

CIRCLE 338 READER SERVICE CARD 225



Disston's Diss-Croloy Circular Saw is excellent for long-run production of nonferrous metals such as brass, copper, aluminum, magnesium, etc. because it is made of a high-carbon high-chrome steel mix for strength and durability. It's also recommended for cleaner cutting of plastics on bench or radial machines. It allows less friction drag . . . resists abrasion. Its polished curved gullet produces a free flow of chips . . . and when operated under normal conditions, will not crack at the gullet. Closely controlled side clearance combined with a high polished finish gives you a cooler running saw. Available in 6" to 16" diameters . . . other sizes on request.

See your distributor for more detailed information on the Diss-Croloy Circular Saw. Ask him about Disston's full line of high-quality metal cutting saws—including metal cutting circular saws, carbide saws, metal cutting band saws, and machine hack saw blades. Or, write to *Disston Division, H. K. Porter Company, Inc., 196 Tacony, Philadelphia 35, Pa. In Canada: Acton, Ont.*

DISSTON PORTER DIVISION

H.K. PORTER COMPANY, INC.

PORTER SERVES INDUSTRY: with Rubber and Friction Products—THERMOID DIVISION; Electrical Equipment—DELTA-STAR ELECTRIC DIVISION, NATIONAL ELECTRIC DIVISION; Copper and Alloys—RIVERSIDE-ALLOY METAL DIVISION; Refractories—REFRACTORIES DIVISION; Electric Furnace Steel—CONNORS STEEL DIVISION, VULCAN-KIDD STEEL DIVISION; Fabricated Products—DISSTON DIVISION, FORGE AND FITTINGS DIVISION, LESCHEN WIRE ROPE DIVISION, MOULDINGS DIVISION; and in Canada, Refractories, "Disston" Tools, "Federal" Wires and Cables, "Nepcoduct" Systems—H. K. PORTER COMPANY (CANADA) LTD.

NAMES IN THE NEWS . . .

Griffin M Stabler, plant superintendent, has been promoted to manager of production of the Alloy Tube Division of Carpenter Steel Co, Union, NJ.

OBITUARIES

John Cromwell Lincoln, 92, founder of the Lincoln Electric Co of Cleveland, died in Phoenix, Ariz, May 24. At the time of his death he was honorary board chairman of the company which he organized in 1893. A pioneer in the field of shielded arc welding, the firm is one of the world's largest manufacturers of arc-welding equipment. The company has been cited frequently throughout the years as a model of factory efficiency and good employee-employer relations. Mr Lincoln was president of the organization from 1906 to 1928, and board chairman until 1954. In 1904 he formed the Lincoln Electric Manufacturing Co (now Reliance Electric Manufacturing Co) through which he developed many inventions among them the variable speed motor.

Alton Frank (Charlie) Davis, 69, vice president and secretary of the company, died May 25 in Cleveland. Mr Davis' association with the organization was exceeded in length only by the careers of James Lincoln, now board chairman, and his brother John. An author, and editor of technical books, Mr Davis established one of the most extensive welding libraries in the world at Ohio State in 1942.

Elmer Ellstrom Sr, 72, founder of Dearborn Gage Co, Dearborn, Mich, and son of the inventor of precision gage blocks, died May 9. Although nominally retired since 1953, Mr Ellstrom remained active in the affairs of the company which he organized in 1936.

James C Mabe, 41, vice president of the Chicago Pneumatic Tool Co, died May 22 in Tulsa, Okla.

John B Hendrickson, founder and board chairman of Welding Engineers, Inc, Norristown, Penna, died May 1. An inventor and holder of many patents, Mr Hendrickson pioneered the dual worm method of plastics processing.

R J Skinner, 52, sales manager of Rockford Machine Tool Co, Rockford, Ill, died April 26.

Inspect your gears the practical, low-cost way

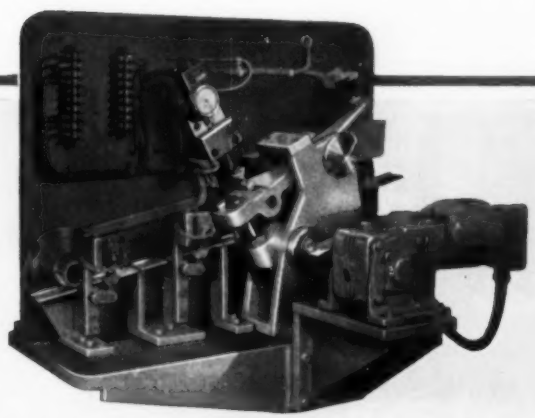
Many gear makers favor Red Ring gear inspection machines because they are precise without being delicate or temperamental — equally effective in either the gear laboratory or the busy production shop. Just practical and economical.

Red Ring machines provide for such Automatic Operations as:

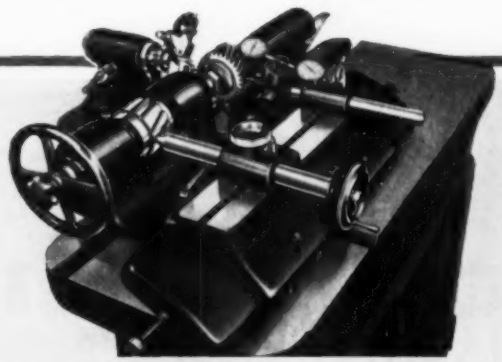
- Gaging of size and helix angle
- Sorting according to size and helix
- Recording of gear measurements

Red Ring machines also check such individual gear characteristics as Index, Eccentricity, Wobble, Lead or Helix, Size and Tooth Parallelism.

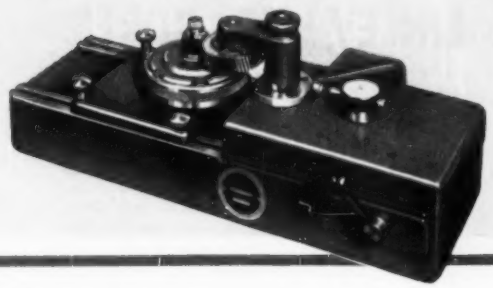
We can't show here the many models now in service throughout industry, but you may have Bulletin C-55-9 which describes them in detail. Why not write for it today?



Automatically checks tooth size of gears with integral flanges too large to pass through conventional feed chutes. In-tolerance, oversize and undersize parts are segregated. (Machine cover removed)



Lead Comparator with an additional interchangeable head for measuring other tooth characteristics. (Tooth spacing head shown)



Rolling fixture provides a rapid check of composite errors and tooth surface roughness.

8287

SPUR AND HELICAL GEAR SPECIALISTS
ORIGINATORS OF ROTARY SHAVING, GEAR HONING AND ELLIPTOID

NATIONAL BROACH & MACHINE CO.

5600 ST. JEAN . . DETROIT 13, MICHIGAN

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

This Cogsdill special cut-off tool, a variation of Cogsdill's famous Baksink, removes excess tubing from heat exchanger tube sheets at the rate of 200/hr. Time studies by one user showed time savings of 70% with this tool. A Baksink tool such as this makes quick work of cut-off: just one pass and the job's done. Key to this simplicity is Baksink's precisely cam-controlled cutter blade which can be adjusted to depth variations in .001" increments.

Baksink tools are versatile, fast too, for all sorts of back-surface chamfering, spotfacing, grooving, cut-off or radii machining. They eliminate costly special tools, fit any arbor. Send your prints and let Cogsdill engineers show the way to tube cut-off and back-surface savings—with Baksink.

FOR THE ASKING—Catalog on Baksink, Burraway Bearingizing, other Cogsdill time-saving tooling.

Cogsdill

TOOL PRODUCTS, INC.

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CIRCLE 341 READER SERVICE CARD

The **LINLEY JIG BORER**

A Precision Tool — Compact — Simple To Operate

How long can you afford to tie-up large capacity borers for toolroom work? Linley Jig Borers, made specifically for the purpose, can handle all of your small precision jig boring—fast and efficiently. Investigate the possibilities in these Linley precision-producers . . . for more flexibility in your shop, for savings in money and machines.

Table Size: 7" x 17½"; Table Travel: 6½" x 10".

IT WILL PAY YOU TO INQUIRE — WRITE NOW!

LINLEY BROTHERS CO.

664 STATE ST. EXT. • BRIDGEPORT 1, CONN.

Another RCA AUTOMATION Product for Better Materials Handling

Low cost automatic

RCA ROTARY HOPPER

Compare the cost and features of these new RCA Automatic Rotary Hoppers, and you'll see why they are gaining such rapid acceptance! They provide every needed operating feature, yet are offered at remarkably low prices . . . beginning at $265, f.o.b., Detroit.

Features:

- **High-speed—up to 20,000 parts per hour.**
- **Handles cylindrical, rectangular, headed disc shaped and other parts.**
- **Parts orientation performed by feed track, not the bowl.**
- **Feed tracks easily changed by loosening one screw.**
- **18", 24", 30" bowls available.**
- **Rugged construction—cast-iron frame; driving mechanism supported by heavy duty self-aligning bearings.**
- **Standard gear-head motor.**
- **Safety-slip drive protects parts and equipment.**
- **Price includes cleats on selector ring and mounting block for tracks.**
- **Demand-control mechanism and wide variety of discharge tracks furnished at modest extra cost.**

Write today for complete information on low-cost RCA Rotary Hoppers. To permit analysis of your needs, send two samples of each part to be handled, and indicate required production rates. Details of other RCA Automation Equipment available on request.

RCA Tmk(s) ®

RADIO CORPORATION of AMERICA

INDUSTRIAL AND AUTOMATION DIVISION

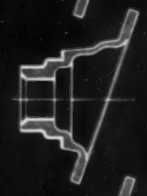
12607 Arnold Ave., Detroit 39, Mich.

CIRCLE 342 READER SERVICE CARD

CIRCLE 343 READER SERVICE CARD

SPECIAL MACHINE TOOLS

Station 1



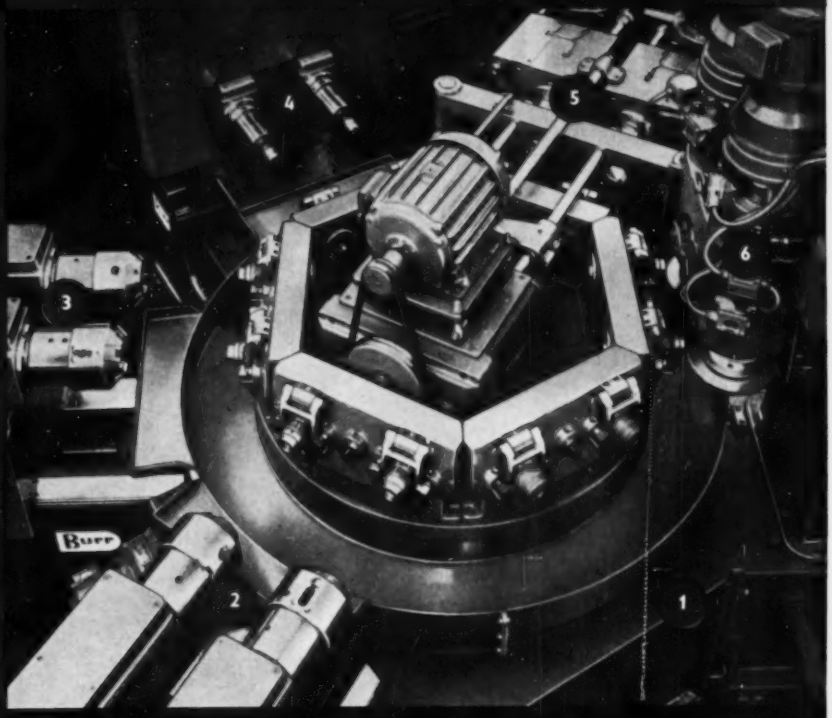
Station 2

Station 3

Station 4

Station 5

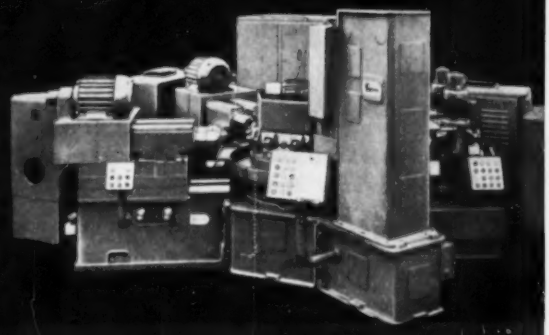
Station 6



Rotary Table Indexing Machine Type R 6-12

comprising 6 stations and 12 spindles for machining gear box top covers

Output: 118 components per hour



LUDWIGSBURGER MASCHINENBAU GMBH

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With Airco's Multiple-Torch Flame Cutting Equipment...

MACHINE QUALITY CUTS

Whether it is the warehousing of steel parts for supply to metal-fabricators, or the production of parts by fabricators for assemblies and end products, multiple-torch flame cutting today plays a role of growing importance in modern industry.

"Machine quality" means close-tolerance cuts with equipment such as Air Reduction's Travograph® (shown in action), just one item in Airco's extensive line. It means elimination of plate-edge preparation for close fit-up, reduced handling and reduced labor costs . . .

Quality cuts with Airco machines are obtainable on a wide range of steel thicknesses for an unlimited variety of shapes. For information about the Airco cutting equipment best suited for your job, call your nearest Airco District Office, or write for literature.

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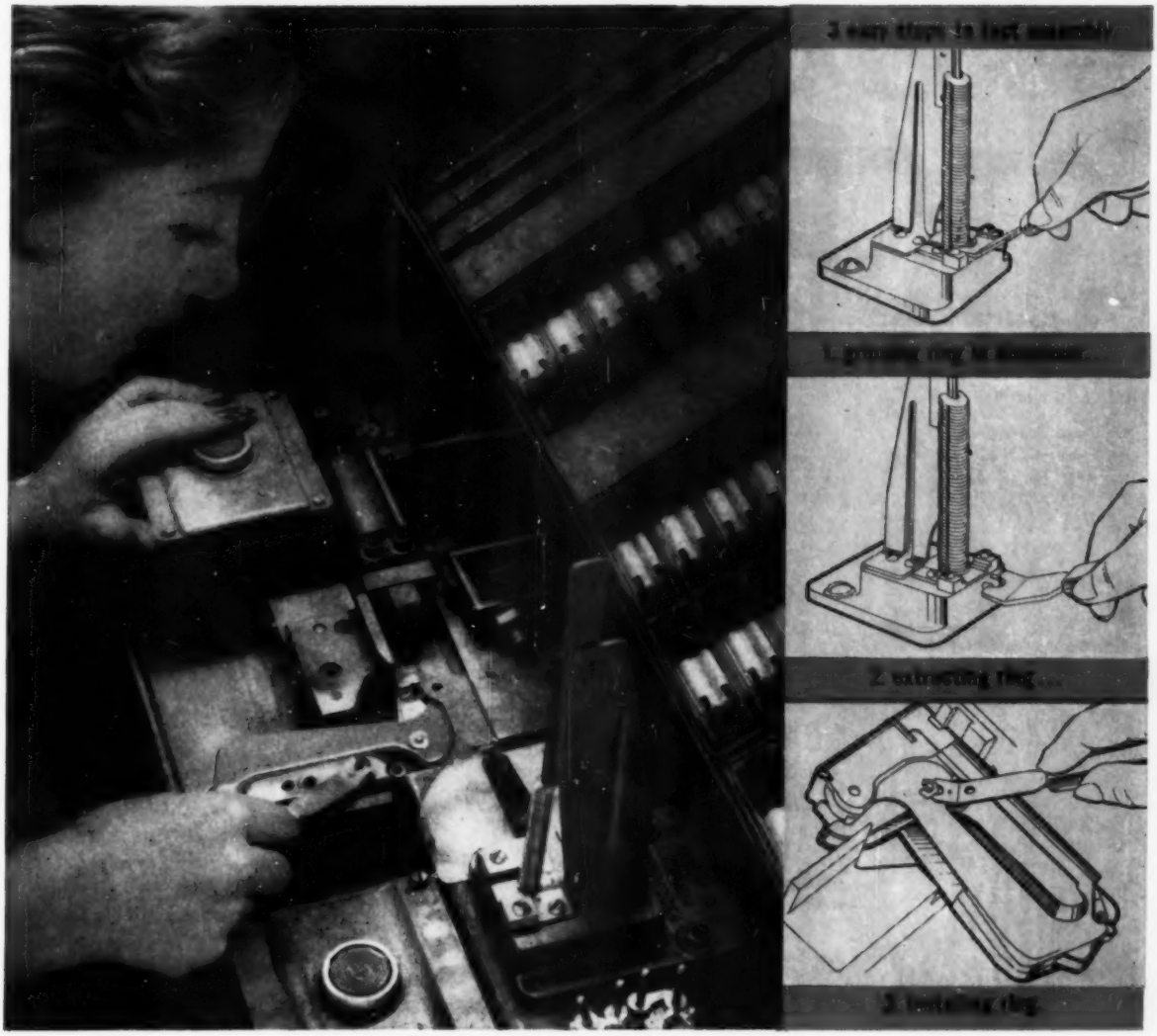
AT THE FRONTIERS OF PROGRESS YOU'LL FIND AN AIR REDUCTION PRODUCT • Products of the divisions of Air Reduction Company, Incorporated, include: **AIRCO** – Industrial gases, welding and cutting equipment • **AIRCO CHEMICAL** – vinyl acetate monomer, vinyl stearate, methyl butynol, methyl pentynol, and other acetylenic chemicals • **PURECO**–carbon dioxide–gaseous, welding grade CO_2, liquid, solid ("DRY-ICE") • **OHIO**–medical gases and hospital equipment • **NATIONAL CARBIDE**–pipeline acetylene and calcium carbide • **COLTON**–polyvinyl acetate, alcohols, and other synthetic resins.



Truarc rings and dispenser speed staple gun assembly 60%

This big production increase was made by Swingline, Inc., Long Island City, N. Y. in assembling the handle lock of their high-compression staple gun.

To speed production, the Truarc Prong-Lock® Series 5139 retaining rings come *pre-stacked* for use on the Truarc *dispenser* (shown in foreground of photo above). Application is simple, fast and requires no skill. The operator, using the Truarc *applicator*, grasps the bottom ring, removes it from the stack, and installs it, quickly and easily, in the staple gun assembly.

The Truarc ring replaced an ordinary flat "C" washer, previously used in this application. *While the unit cost of the washer was lower than that of the Truarc retaining ring, the use of the rings resulted in assembled cost savings of $25.00 per thousand staple guns.* The reasons: a 60% increase in production due to faster, easier assembly with Truarc tools, and the elimination of time-consuming, costly adjustments made possible by Truarc rings. What's more, the bowed Prong-Lock ring improved product design by providing resilient end-play take-up ... eliminating looseness or binding in the parts.

Truarc retaining rings come in 50 functionally different types ... as many as 97 different sizes within a type ... 6 metal specifications and 13 finishes. Truarc assembly tools, pliers, applicators, dispensers and grooving tools are available to speed production of virtually every kind of product. Make sure you have on file the new 16-page Waldes Truarc Assembly Tool Catalog No. AT 10-58. Write for your copy today. And remember Waldes engineers are always ready to help you solve your special application problems. Waldes Kohinoor Inc., 47-16 Austel Place, Long Island City 1, N. Y.

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WALDES
TRUARC®
RETAINING RINGS
Waldes Kohinoor Inc., Long Island City 1, N. Y.

TRUARC RETAINING RINGS ... THE ENGINEERED FASTENING METHOD FOR REDUCING MATERIAL, MACHINING AND ASSEMBLY COSTS

STOP DOWN TIME

Specify

Accurate Drill Jig Bushings

ABC Drill Jig Bushings are made of high carbon, chrome bearing steel. Their outstanding resistance to wear means **they last longer** — are kind to your drills.

ABC bushings **are more accurate** . . . you are assured of uniformity and dimensional stability. All finished ground Accurate Bushings are held to a concentricity of .0003" T.I.R. at the exit end of the bore.

ABC Drill Jig Bushings, for all their extra fine qualities, **cost no more** than ordinary bushings.

You can get ABC Bushings in a **hurry** . . . **same day shipments** of all ASA Standard sizes and fast, **fast service** on all special sizes.

ABC

Write for Catalog B-58 and get full information.

ACCURATE BUSHING CO.

ASA Standard Drill Bushings • Precision Parts • Lift-Swing Drilling Fixtures

440 North Ave., Garwood, New Jersey

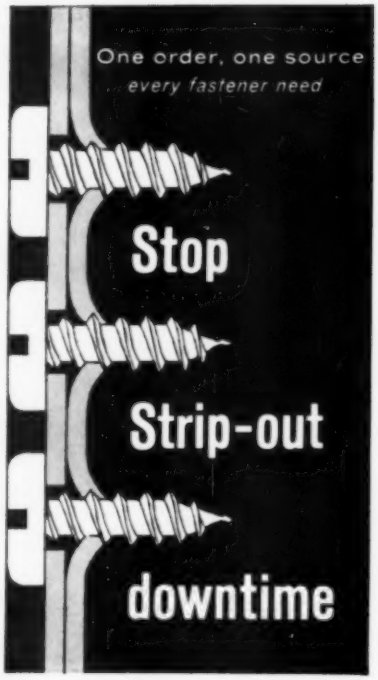
CIRCLE 347 READER SERVICE CARD

Looking For Something?

—of course you are. Every reader of American Machinist is.

Some find what they are looking for in the editorial pages, some in the advertising by manufacturers, some in the "Searchlight" advertisements. The latter includes many advertisements seeking or offering "something" — used, rebuilt, surplus new equipment, or a business opportunity that you may be able to supply, or want.

You will always find checking the "Searchlight" ads interesting, informative and profitable.



SO-HARD Tapping Screws

Production downtime in assembly operations is an expensive item—especially when strip-outs occur. So-Hard sheet metal screws end costly losses of production time. Made from specially processed steel wire, these screws are heat-treated for greater resistance to torque, shear and tension loads. True concentricity of slot to screw axis, and precisely formed threads assure the proper fit for a secure, reliable grip.

Joins metal or plastic. Available from stock in Type A and B for prompt delivery . . . all heads . . . sizes ¼" x No. 2–2" x No. 14. Southington Hardware Division, Screw and Bolt Corporation of America.

SCREW AND BOLT CORPORATION OF AMERICA P.O. Box 1708 Pittsburgh 30, Pa.

Formerly Pittsburgh Screw and Bolt Corporation

America's Most Complete Line of Industrial Fasteners

CIRCLE 349 READER SERVICE CARD

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TAPEnology keeps hospital steel surgery bright!

Tough "SCOTCH" Brand Protective Tape No. 343 is now giving the Shampaine Company of St. Louis protection all along the line . . . keeping stainless steel components of equipment for physicians and hospitals scratch- and blemish-free during fabrication and assembly.

The No. 343 tape is dispensed onto sheets of polished stainless steel by customer-built semi-automatic applicator made to plans supplied by 3M's Customer Engineering Department. Tape is 36" wide; protects full width of metal against scratches; eliminates die marks on stainless previously experienced with other materials. Tape stays on up to the point of welding, and then only the corners need be exposed. Time and labor savings produce an overall saving in cost.

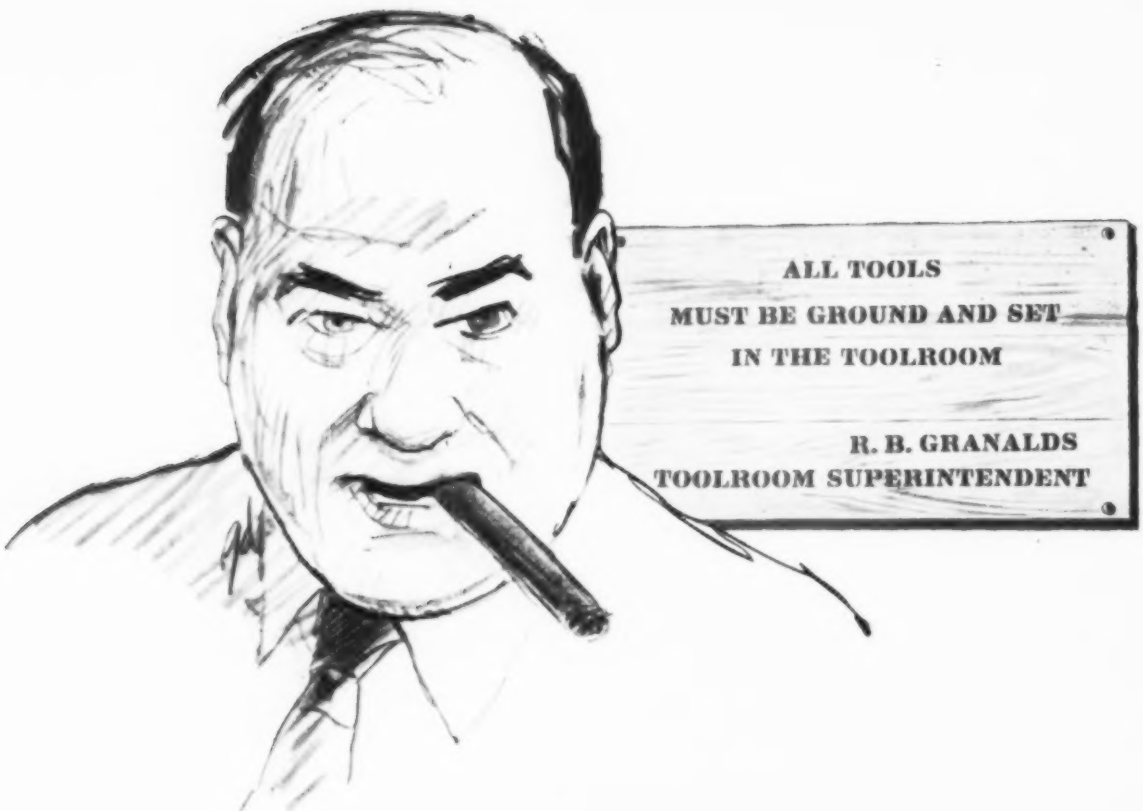
What metals do you fabricate? Ask your nearest "SCOTCH" Brand Tape Distributor to show you how "SCOTCH" Brand Protective Tapes can simplify and save on your production. Or, write: 3M Co., St. Paul 6, Minn., Dept. MA-69.

When tape costs so little, why take less than "SCOTCH" Brand?

"SCOTCH" is a registered trademark for the pressure-sensitive adhesive tapes of 3M Co., St. Paul 6, Minn. Export: 99 Park Ave., New York 16. Canada: London, Ontario.

MINNESOTA MINING AND MANUFACTURING COMPANY
. . . WHERE RESEARCH IS THE KEY TO TOMORROW

3M COMPANY



"We're responsible for all the tools in the plant"

"Since we took over the sharpening and setting of all tools about two years ago, average tool life in the shop has increased by a third. It all started with an article in one of the magazines we get. I sold the idea to the boss and it really panned out."

Many a cost-cutting idea in Metalworking has started in the same fashion: with an article or advertisement in a magazine. With stress today on higher output at lower cost, Metalworking production management is alert to ways that will achieve these twin aims. Men like our hypothetical but typical Granalds must work out ways to do the job – and spend less.

American Machinist is a veritable gold-mine of ideas for Metalworking engineers and executives. It presents them with basic production data coupled with the newest developments and in-plant know-how throughout a $120 billion industry. That's why, in plant after plant, Metalworking production men will tell you . . .

"I have to read American Machinist"

McGraw-Hill Magazine of Metalworking Production
330 West 42nd Street, New York 36, New York

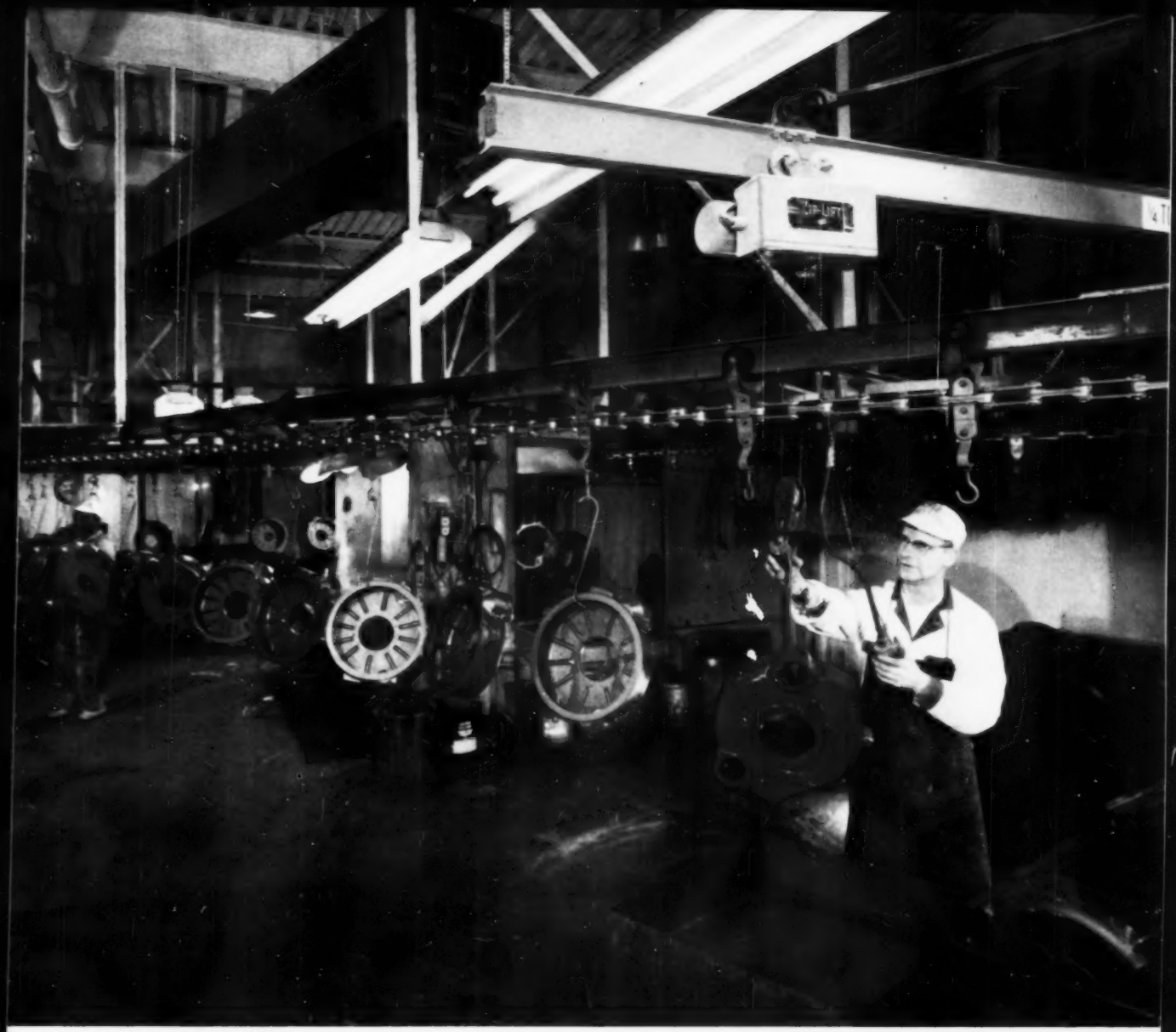


Photo Courtesy Wacho Mfg. Co.

6000 ORDERS A DAY DON'T TIRE A ZIP-LIFT!

An operator's thumb punches over 6000 commands a day into this production-line P&H Zip-Lift in a painting, coating, and tinning plant. The sturdy hoist responds promptly . . . never tires . . . and comes up asking for more.

The control pendant on a Zip-Lift operates on a safe 24-volt circuit — typical of the many safety features P&H builds into this low cost unit. There are two brakes, either of which will hold a capacity load even if power fails . . . shrouded load-block to protect workers hands . . . limit switches that guard against equipment abuse . . . and many more features that make P&H Zip-Lift hoists extra-safe and extra-dependable.

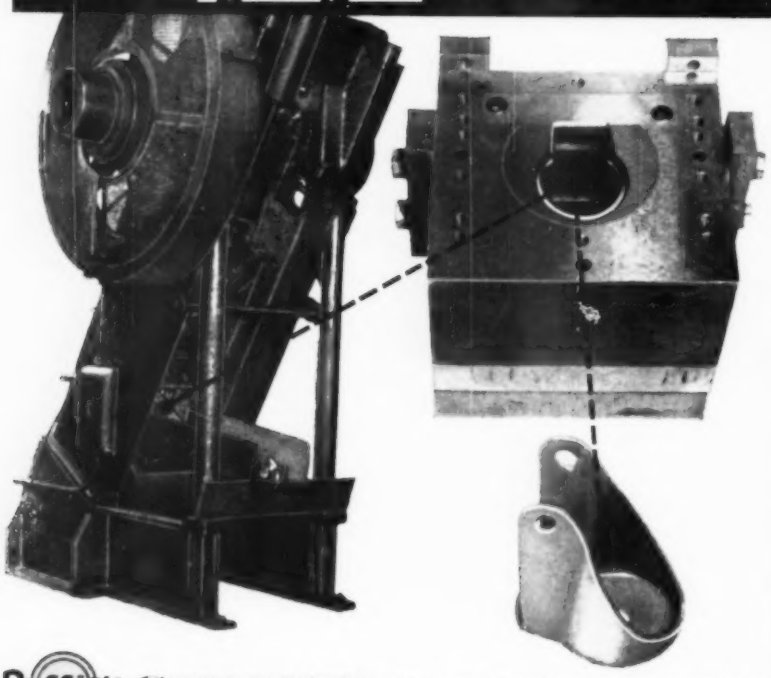
Are you guarding your personnel and your production with P&H Zip-Lifts . . . or are you going to start with your very next hoist purchase? Bulletin H20 will help you plan that purchase. It's free from Dept. 202, Harnischfeger Corp., Milwaukee 46, Wisconsin.

OUR 75TH YEAR

P&H HARNISCHFEGER

...quality and service for 75 years

Talide® DIE IN SERVICE 8 YEARS DRAWS 9,000,000 CASTER PARTS!



Bassick COMPANY, Bridgeport, Connecticut, leading producer of casters, chair controls, automobile and specialty hardware, was experiencing difficulty drawing an eccentric shaped chair caster part from commercial quality hot rolled drawing steel.

Scrap rate was high—production per die low. The high-speed steel die being used (costing $350.00) had to be reground and polished every 30,000 pieces, and replaced several times a year.

A Grade C-85 Talide die (costing $1100.00) was installed in 1950 and to date has produced over 9,000,000 caster parts. During this 8-year production run, the Talide die has required no servicing and is still in operation.

Bassick Company engineers report that the quality of their product has been improved. Surface marks and scratches, caused by scoring and galling of the steel dies previously used, have been completely eliminated.

A Talide die engineer can help you cut costs and increase production on draw presses, punch presses, pill presses, cold headers, swagers and draw benches.

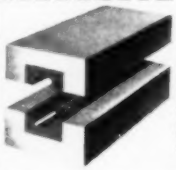
METAL CARBIDES CORPORATION
6001 Southern Boulevard Youngstown 12, Ohio

Send for 76-Page Catalog 56-G

METAL CARBIDES CORPORATION
TALIDE®
YOUNGSTOWN 12, OHIO

HOT PRESSED AND SINTERED CARBIDES • VACUUM METALS
HEAVY METAL • ALUMINUM OXIDE • HI-TEMP. ALLOYS
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY

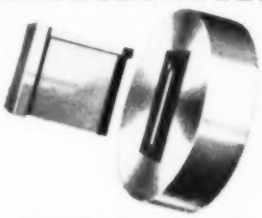
WIRE DIES
Hundreds of miles of steel and non-ferrous wire—.004 to .750—drawn through TALIDE dies.



SWAGING DIES
Leading fountain pen manufacturer cold swages 33 times more stainless steel parts with TALIDE dies.

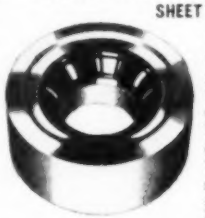
HEADING AND EXTRUSION DIES
Cold heading ¼" C-1008 rivets. TALIDE dies produced 11,200,000 pieces, other carbide dies only 3,500,000.

CURLING ROLLERS
TALIDE curling rolls last 65 times longer than steel rolls on beverage can forming operation.



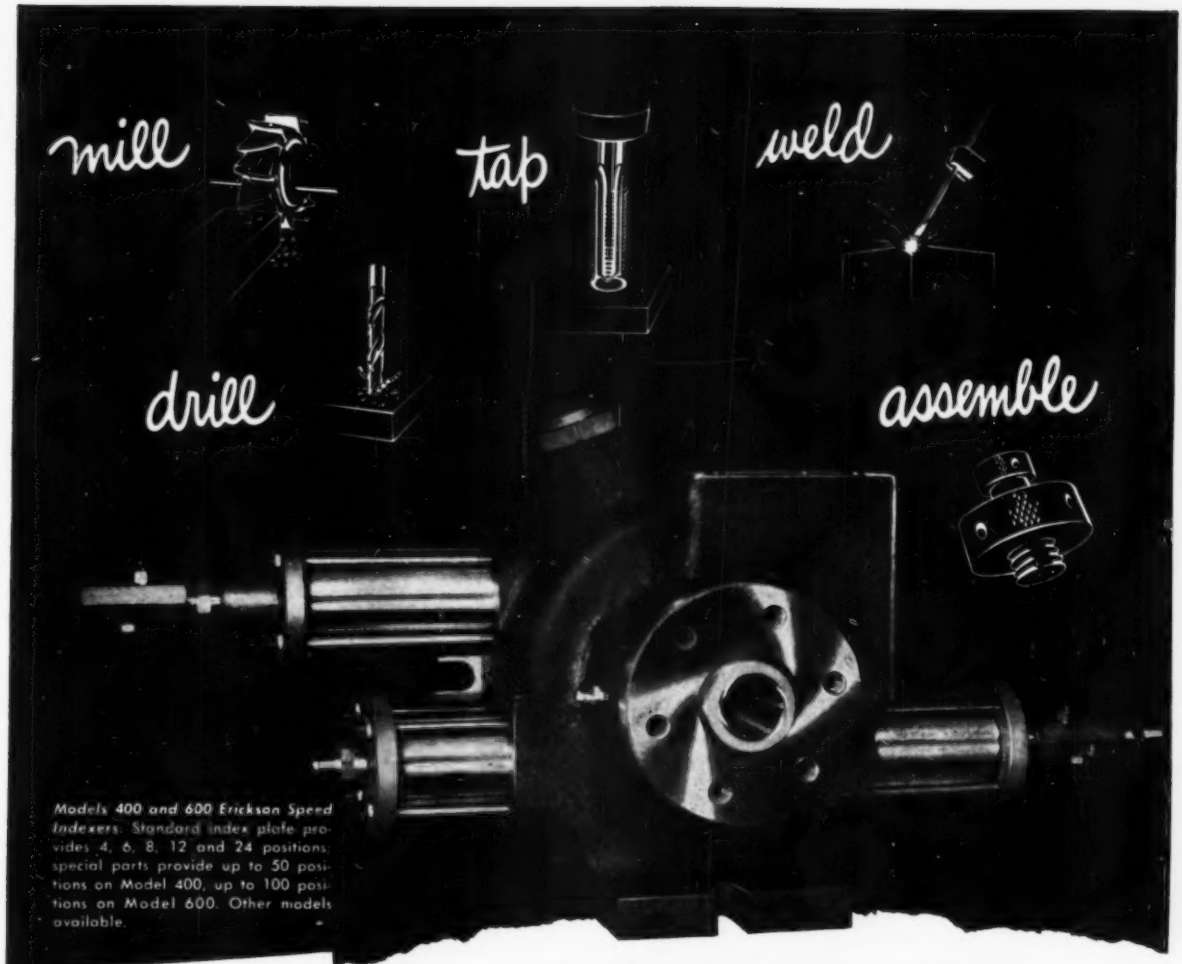
BLANKING AND FORMING DIES
70 times more paper discs blanked out with TALIDE—over hard alloy die.

SHEET METAL DIES



137,000 hi-alloy steel pressure vessels drawn with TALIDE against only 7,900 with steel dies previously used.

POWDERED METALLURGY DIES
Compacting highly abrasive chemical powders, TALIDE pill dies last 4 months; steel dies wore out in 6 hours.



Models 400 and 600 Erickson Speed Indexers. Standard index plate provides 4, 6, 8, 12 and 24 positions; special parts provide up to 50 positions on Model 400, up to 100 positions on Model 600. Other models available.

Angular accuracy within 2 minutes... repetitive accuracy in low "tenths" of a thousandth

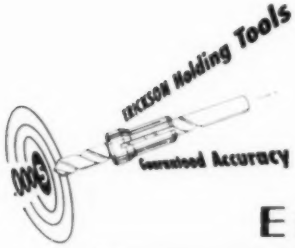
ERICKSON INDEXERS—

the economical way to smash automation bottlenecks

Even the most elaborate automatic production line can bog down *expensively* without rapid and accurate automatic parts positioning.

That's where Erickson Indexers really pay off. For you can interlock them into your production set-up with micro switches and solenoid valves. The hardened and ground lock pin operates in conjunction with the actuating mechanism to assure *positive positioning and angular accuracy within 2 minutes of a degree.* (Repetitive accuracy is no indication of angular accuracy. Erickson holds repetitive accuracy in low "tenths" of a thousandth.) And Erickson Indexers can maintain this great accuracy because their adjustable, self-contained shock control unit delivers a cushioned rotary load to the mechanism, thereby reducing wear.

Speed to keep lines moving . . . accuracy to reduce rejects . . . long life to cut maintenance and capital investment – all add up to Erickson Indexers, the *economical* way to smash automation bottlenecks.



Write for Erickson Catalog K today! You'll find many interesting applications for all Erickson holding tools. Take advantage of our free engineering service. An Erickson field engineer will gladly work with you for production economy.

ERICKSON TOOL COMPANY

34359-6 Solon Road • Solon, Ohio

COLLET CHUCKS • FLOATING HOLDERS • TAP CHUCKS • TAP HOLDERS • AIR-OPERATED CHUCKS
EXPANDING MANDRELS • SPECIAL HOLDING FIXTURES

AA-2139

HAVE YOU CHECKED THESE FACTS ON GUN DRILLING?

The Most Economical Gun Drilling Machine on the Market.

Utilizes the Full Potential of Modern Rotating Gun Drills.

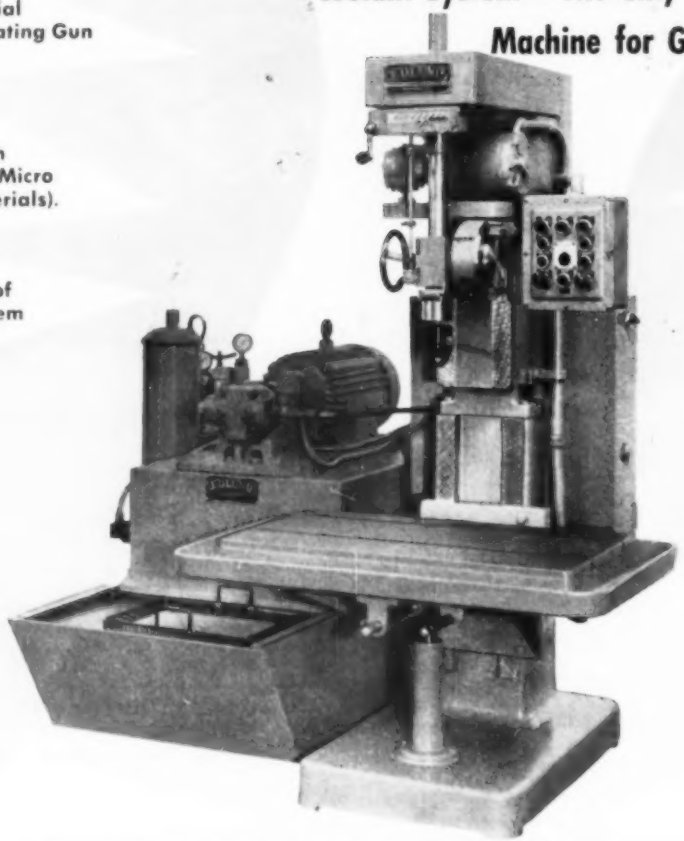
Deep, Accurate Holes with Fine Finish (2 to 32 Micro Inches in most materials).

Easy Drilling of Difficult Problem Holes.

Ability to Precision Drill Odd Shaped Pieces.

EDLUND

Gun Drilling Machine Model 2G and High Pressure Coolant System — The only Vertical Gun Drilling Machine for General Purpose Work.



Accurate Drilling of All Types of Material — Aluminum, Cast Iron, Brass, Tool Steel, Stainless, and other Steels.

Can Eliminate Second Operations — Reaming, Grinding, and Honing.

Write for descriptive Bulletin 2G or contact the EDLUND Representative in your area for complete information on the Vertical Gun Drilling Machine and Coolant System.

SPECIAL CONTRACT JOB WORK FOR GUN DRILLING CAN BE ARRANGED WITH EDLUND. SEND PART, BLUEPRINT AND REQUIREMENTS.

EDLUND REPRESENTATIVES IN MAJOR CITIES

EDLUND

MACHINERY COMPANY Cortland, New York

Division of Harsco Corporation

YOU'RE JUST A FINGER-TWIST AWAY FROM ALCOA ALUMINUM FASTENERS

IF YOU can dial a telephone, you have just about all the "inventory control" you'll ever need to keep you stocked up with Alcoa® Aluminum Fasteners. For, thanks to Alcoa's unmatched distribution facilities, there's a *local* distributor near you with full stocks of Alcoa Fasteners in standard sizes and types . . . to be delivered in a jiffy!

And, of course, Alcoa Aluminum Fasteners are a sound choice in *any* case. Bright, flawless finish adds extra appeal to your product at the time of purchase—and won't stain it or mar it any time *after* purchase. Moreover, as everyone knows, you always get *full* count, *full* quality when you specify Alcoa—whether you order a hatful or a carload!

So don't worry if stocks run short. Look up your local distributor in the Yellow Pages of your phone book. Call him. He'll give your order *action* at the local level almost before you can hang up! *P.S.:* For additional facts and samples of Alcoa Aluminum Fasteners, just mail the coupon below.

Your Guide to the Best in Aluminum Value

ALCOA ALUMINUM

For Exciting Drama Watch "Alcoa Theatre," Alternate Mondays, NBC-TV, and "Alcoa Presents," Every Tuesday, ABC-TV

Free . . . Facts, Samples . . . Free

Aluminum Company of America
2000-F Alcoa Building, Pittsburgh 19, Pa.

Gentlemen: Please send complete specification data and samples of Alcoa Aluminum Fasteners.

Name_____

Title_____

Company_____

Address_____

NOW...A COMPLETE LINE OF SOLID KENNAMETAL* END MILLS

stocked for immediate delivery

Now, Kennametal Inc. offers you a complete line of solid, precision ground end mills made of the same consistently high quality tungsten carbide that has been used for years in other types of Kennametal cutting edges for the metalworking industry.

Developed in 1938, Kennametal was the first hard cemented carbide to successfully cut steel. Since that time, many varied compositions or grades have been developed for practically every metal cutting requirement. Kennametal is known all over the world for its consistently high quality tooling for precision operations. Methods of manufacture used today by Kennametal help produce exceptional properties of wear resistance and high strength not found in the hardest of alloy steels or conventional carbides.

New 12-page Catalog now available. Ask your Kennametal Representative for a copy or write KENNAMETAL INC., Latrobe, Pennsylvania.

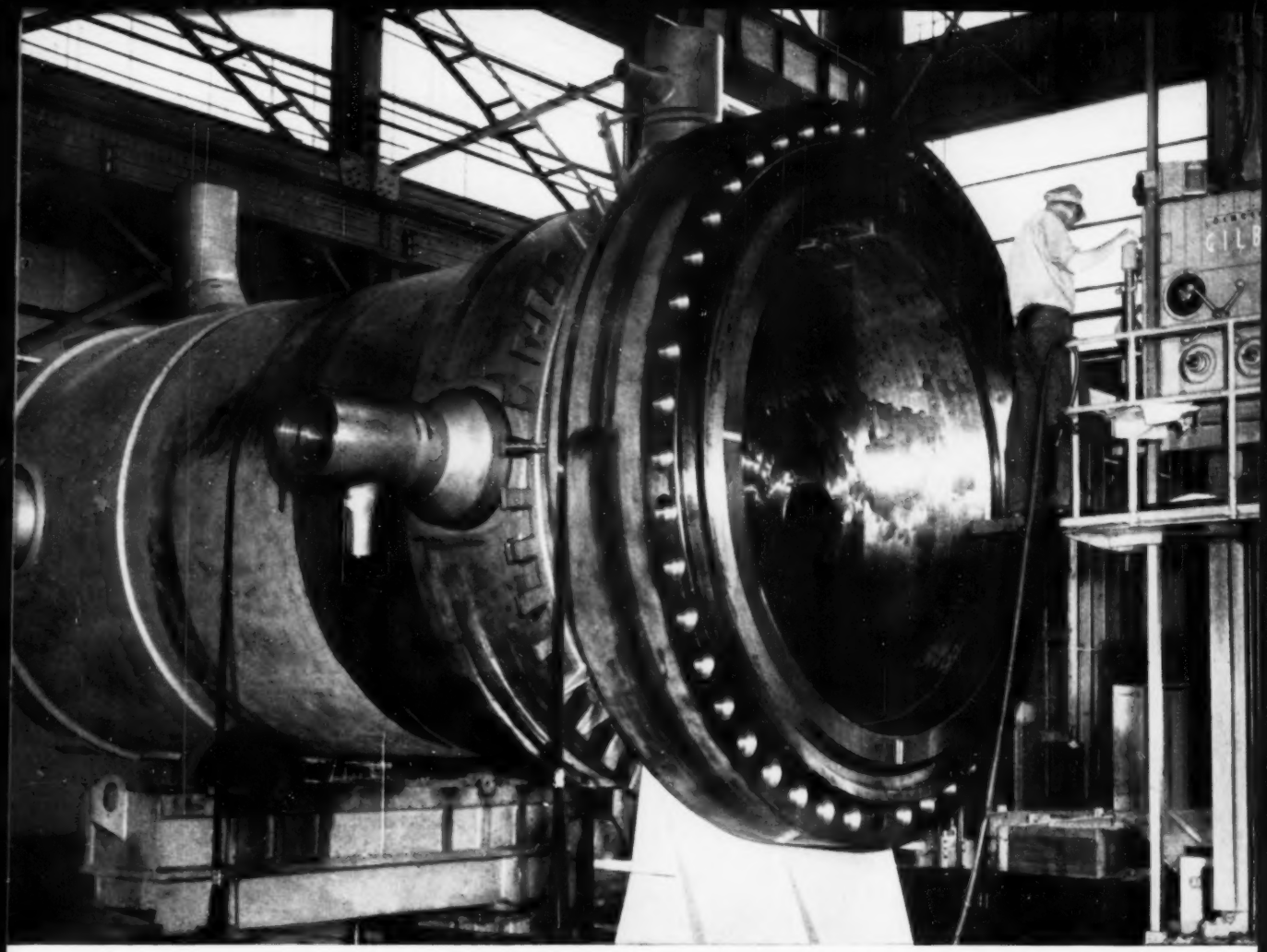
For every job requirement. Stocked in fifteen different styles, new Kennametal End Mills are available in diameters from $\frac{1}{16}$" to $\frac{3}{4}$" . . . a size and style to accurately match your milling requirements.

For better finish. Kennametal has an extremely high YME . . . up to 94 million psi . . . three times that of the hardest steel. High hardness, plus one-piece construction, provides maximum rigidity for smooth, even finish.

For longer life. Kennametal End Mills are *all-carbide* . . . eliminates brazing failure, and provides maximum resistance to heat and abrasion. 97219

*Trademark

INDUSTRY AND KENNAMETAL
. . . Partners in Progress



Courtesy Combustion Engineering, Inc.

Combustion Engineering specified more than "ordinary boring mills"

Combustion Engineering, Inc., pioneer manufacturer of heavy reactor vessels, concluded that ordinary boring mills would not produce the close tolerances and surface finish required in their critical operations. That is why they specified a Cincinnati Gilbert floor type boring mill for this job.

The workpiece is a 96-ton stainless steel reactor for a Naval nuclear power plant. The Gilbert machine is used to finish the boring of the bolt holes in the 20" thick flange, and to machine the outlet nozzles.

Combustion Engineering's high standards require a surface finish of 32 R.M.S. on some of the bolt holes—an easy specification for a Gilbert, which can bore holes with a mirror finish, when required. A Tele-Vernier optical measuring system increases the speed and accuracy of machine positioning.

Work of equally high quality is produced on a number of other Gilbert boring mills at Combustion Engineering's Chattanooga and Windsor plants—proof that "those who buy Gilbert buy Gilbert again."

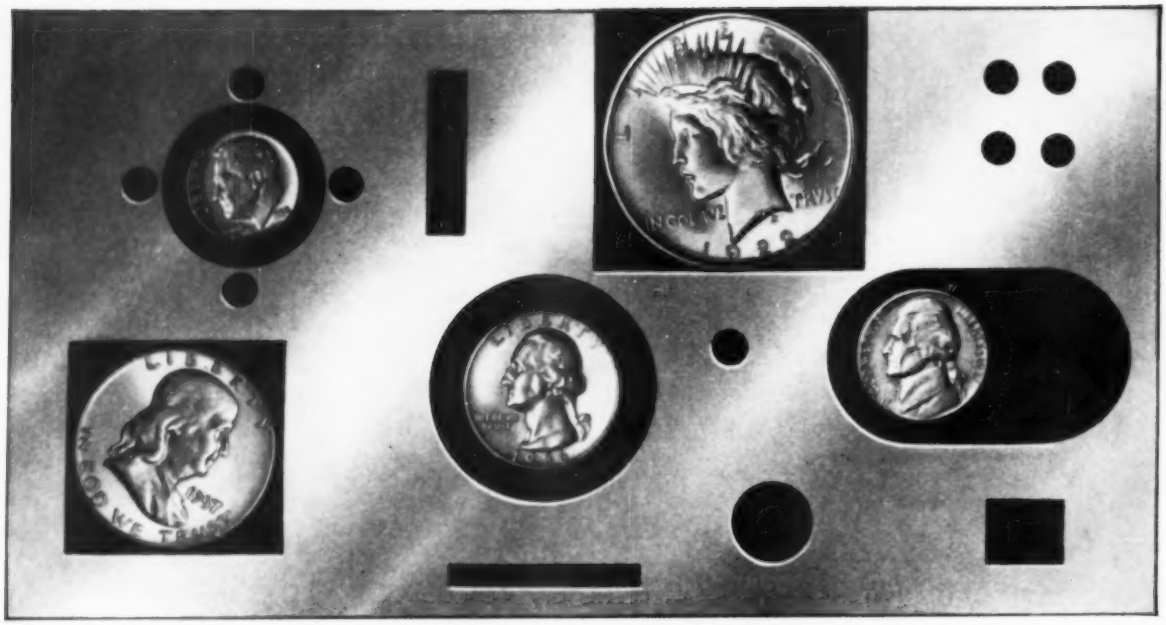
Write for new Bulletin 558.

The Cincinnati Gilbert Machine Tool Co., 3340 Beekman Street, Cincinnati 23, Ohio.

GILBERT

Ask for free catalog 558

CIRCLE 358 READER SERVICE CARD



How Much Are You Paying for Holes?

Producing openings in low quantity work can be costly and time consuming, or it can be a simple, high speed operation —the difference is a Wiedemann Turret Punch Press.

Only a Wiedemann gives you:

1. the speed of a punch press.
2. the immediate availability of a variety of punches and dies in a turret—no setup.
3. a quick setting, mechanical work positioning gauge—no layout.

Parts are produced as needed, and even extensive engineering changes can be made on-the-spot. Holes are produced for as little as a penny each* with standard tooling, and only one punch and die of a size is required. With direct savings of 60% to 90%, the press pays for itself in one to two years.

Take a closer look at the savings you can expect with the Wiedemann Method. Send drawings of your work for time study and write for Bulletin 301.

TYPICAL WORK PRODUCED ON WIEDEMANN TURRET PUNCH PRESSES

- Aircraft and missile components.
- Road building equipment and trucks: mixers, spreaders, shovels, cranes, etc.
- Electrical panels, switchgear, housings, cubicles and components.
- Electronic chassis: control, television, radar, computers, etc.
- Industrial refrigeration, laundry, baking, kitchen, food dispensers and similar equipment.
- Instrument mountings and panels.
- Air conditioning: housings, baffles, etc.
- Pre-production prototypes.
- Machinery: fabricated bases, side structures, conveyors, etc.

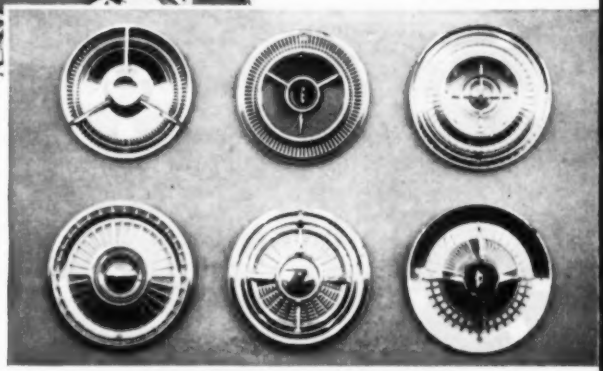
** Many Wiedemann users are selling holes profitably at a penny apiece.*

RA-41P Wiedemann
15-ton capacity
28" throat depth

Other models from 4 to 150 tons

WIEDEMANN MACHINE COMPANY
TURRET PUNCH PRESSES

DEPT. AM-6 • GULPH ROAD • KING OF PRUSSIA, PA.



Can you name the cars represented by these stainless steel wheel covers? A postcard request will bring you the answers.

Brightness is Not Enough

Wheel covers must be more than just bright. They must have strength, spring temper, durability and low unit cost in volume production.

Other materials may claim some of these characteristics, but only stainless steel actually possesses all of them — and has a performance record to prove it.

It is easy to **make cheaper wheel covers.** Just forget that customer complaints, lost goodwill and the inevitable replacement of parts eventually show up on the balance sheet.

In wheel covers there is no substitute for stainless steel's lasting brightness, strength and durability.

Plants and Service Centers:
Los Angeles • Kenilworth (N. J.) • Youngstown • Louisville (Ohio) • Indianapolis • Detroit

J&L
STAINLESS
SHEET • STRIP • BAR • WIRE

Jones & Laughlin Steel Corporation • STAINLESS and STRIP DIVISION • Box 4606, Detroit 34

Another MANHATTAN "FIRST"...

The **Original** SAFETY BACK WHEEL DEVELOPED IN 1956

MANHATTAN SAFETY BACK FLARED CUP

Not simply a new safety "feature" . . . not merely a design "improvement." Here's a *totally new concept* of flared cup wheel design *and* construction . . . developed by Manhattan engineers to give the greatest safety and performance advantages possible for flared cup wheel users. Manhattan's revolutionary SAFETY BACK Flared Cup puts portable wheel *safety* where it counts the most—in *original* strength and breakage resistance!

SAFETY BACK far surpasses such safety features as anchor bushings, safety rings, special hub mountings, or ordinary revolving cup guards. With SAFETY BACK, steel covers the *entire* back of the flared cup . . . extends down the side to offer a degree of reinforcement and breakage resistance never before possible!

NO OTHER WHEEL—AT ANY PRICE—OFFERS THESE EXCLUSIVE FEATURES

- **Greatest Initial Strength**
- **Highest Safety Factor**
- **Easy Mounting—Easy Operation**
- **Improved Mounting Base**
- **One Piece Assembly**
- **Requires No Adjustment**

Only SAFETY BACK gives you these features—*plus* Manhattan's custom-engineered abrasive bond for *faster* removal of *more* metal on your particular job—at no additional cost! For "More Use per Dollar" in portable grinding operations, you can't get a faster cutting, longer lasting—*safer* wheel than MANHATTAN.

Let a Manhattan abrasive wheel engineer show you the advantages of SAFETY BACK Flared Cups, and other types of Manhattan high speed, heavy duty abrasive wheels. Write for Bulletin 7157.

RM-959

GRINDING WHEEL INSTITUTE MEMBER

RM

WRITE TO ABRASIVE WHEEL DEPARTMENT

MANHATTAN RUBBER DIVISION—PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.

Belts • Hose • Roll Covering • Tank Linings • Industrial Rubber Specialties • Abrasive and Diamond Wheels • Brake Blocks and Linings • Clutch Facings • Asbestos Textiles • Mechanical Packings • Engineered Plastics • Sintered Metal Products • Industrial Adhesives • Laundry Pads and Covers • Bowling Balls

Conduit box can be located top, bottom, or either side.
Control hand wheel can be positioned on top or either side.
All end-bracket assemblies are interchangeable for repositioning of drive components.
GET ALL THESE VARIATIONS FROM ONE BASIC DESIGN
—with wrench and screwdriver!
Output shaft can be high or low, right or left.
Motor can be mounted top or bottom.
Detachable feet can be bolted to bottom, side, or top for floor, wall, or ceiling mounting.
Just two of many variations that can be made from a standard ALLISPEDE DRIVE.

The ALLISPEDE* DRIVE gives you complete field versatility!

It's the most flexible and precise mechanical adjustable speed drive made . . . and the only one that can be fully adapted in the field!

The *all-new* ALLISPEDE DRIVE is the answer to any motor application that calls for low-cost adjustable speed. It permits smooth, easy speed adjustment — and maintains it exactly. Its modern design permits unusual field-flexibility — lets the user change the unit *any time* to suit his various requirements.

The a-c ALLISPEDE DRIVE is the *only* drive that can be fully adapted in the field by the user. The basic unit goes together like building-blocks . . . feet, end brackets, control hand wheel, conduit box, and output shaft can be relocated in minutes to fit existing space limitations. The same unit can be changed from an upright to a horizontal drive for floor, wall or ceiling mounting. And all you need is a wrench and screwdriver!

Superior design improves drive efficiency and extends service life. The four bearings equally distribute belt load, increasing bearing and belt life. Movable discs slide smoothly on internally-lubricated splined shafts — won't stick in place or wear. Belt changes are faster — never disturb the dial or adjustment mechanism. Rugged cast-iron housing with plated steel covers shields drive against dirt and corrosion . . . integral rotor fan cools the motor and force-ventilates the drive housing to extend bearing life. Oversize cartridge bearings are pressed on shaft and lubricated at the factory. Corrosion-resistant stainless steel nameplates diagram proper motor connection, specify bearing sizes, and carry complete instructions for operation and lubrication.

The ALLISPEDE DRIVE can be supplied with in-line or right-angle integral gears, brake and tachometer. Sizes from 1 to 20 HP with speed variations up to 8:1. Electrical and mechanical modifications are available to meet special requirements for any application.

Contact your Louis Allis District Office or Distributor for complete information and engineering assistance. Or write for Bulletin 3300, The Louis Allis Co., 452 E. Stewart Street, Milwaukee 1, Wisconsin.

*ALLISPEDE is a trademark of The Louis Allis Co.

ASD-118

LOUIS ALLIS

MANUFACTURER OF ELECTRIC MOTORS AND ADJUSTABLE SPEED DRIVES

This is a picture of a new product

It's nothing you can use in your plant tomorrow — or even next year. But Allis-Chalmers is working on it *now* to meet the needs of industry in the future.

Fundamental research of materials, processes and equipment is an important part of the A-C contribution to industry. *This enables product design engineers to make existing products even better, to create a continuous flow of new equipment, to help industry achieve new efficiencies and economies.*

Research and development are only two reasons why A-C is recognized as a leader in supplying both electrical and mechanical equipment for industry. Single-source availability of "teamed" equipment, maximum engineering help and outstanding service facilities are others.

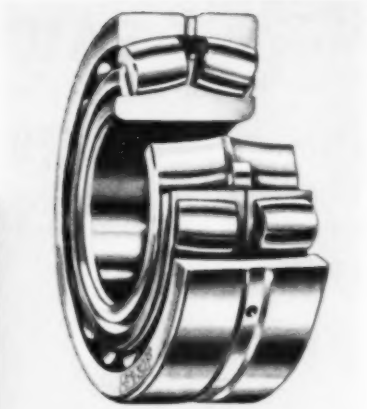
Talk *to your A-C representative or distributor soon about your requirements. Or write Allis-Chalmers, Milwaukee 1, Wisconsin.*

Products for industry: Electrical Generation, Distribution and Utilization Equipment; Pumps; Compressors; Mechanical Power Transmission Equipment; Processing Machinery; Motors and Control; Water Conditioning Systems, plus Materials Handling Equipment.

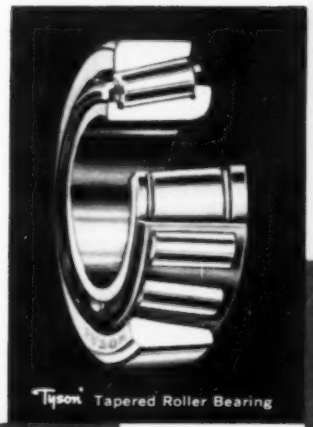
ALLIS-CHALMERS

A-1004-G1

THIS high temperature, high pressure experimental apparatus is used to induce changes in existing materials, to produce new materials. From such experiments come new equipment efficiencies and economies.



Spherical Roller Bearing



"Tyson" Tapered Roller Bearing

Spherical Roller Thrust Bearing

Single Row
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Angular
Contact Bearing

When can a standard bearing do a "special" job?

Suppose you need a high speed bearing to support either heavy thrust load or thrust load combined with radial load. It is almost a certainty that SKF angular contact ball bearings will do the job.

SKF bearings of this type are produced in bore sizes ranging from ¾" to just over 7". They lend themselves to all sorts of mountings. For example, you can mount them in pairs either face-to-face or back-to-back where axial rigidity and high radial capacity are needed. Or you can mount two or more bearings in tandem, where a particularly high thrust capacity is required.

Yet this is a standard SKF bearing, promptly available in over 80 sizes of single- and double-row types.

Almost every SKF bearing can do "special" jobs for you. Why not find out how they'd be more efficient and economical? Call any one of the twenty-five sales offices.

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Spherical, Cylindrical, Ball, and "Tyson" Tapered Roller Bearings

EVERY TYPE—EVERY USE

SKF®

SKF INDUSTRIES INC. PHILADELPHIA 32, PA.

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SB-721¼

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Youngstown cold-rolled steel sheets

This new industrial building is getting a long-lasting, weather-resistant Galbestos roof—one that will offer optimum resistance to both fire and corrosion. It will withstand a concentrated load and an impact load as well as a uniform load.

Pittsburgh's H. H. Robertson Company fabricates their Galbestos sheeting from Youngstown Cold-Rolled Sheets. That's because they require a basic raw material that combines minimum weight with great strength—and Youngstown more than meets the specification.

Wherever steel becomes a part of things *you* make, the high standards of Youngstown *quality*, the personal touch in Youngstown *service* will help you create products with an "accent on excellence".

One of a battery of Robertson-designed corrugating machines at work fabricating Youngstown Cold-Rolled Sheets in the production of Galbestos.

Youngstown
Youngstown, Ohio
THE YOUNGSTOWN SHEET AND TUBE COMPANY
Carbon, Alloy and Yoloy Steel

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Every DoALL Band Tool is unconditionally guaranteed to meet all current published specifications, including set tolerances, and to be completely free of defects in material, workmanship, heat-treating and packaging. Any band not meeting these specifications will be replaced free of charge provided the band is returned, prepaid, to DoALL.
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SB-7014

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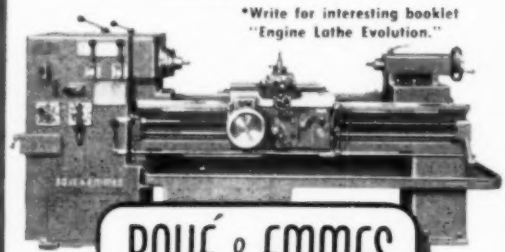

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PHOTO BY KARSH OF OTTAWA

"Steel quality is vital to Shu-Lok— Sharon has the quality we want"

—CARL M. JOSLYN, plant manager, Shu-Lok Fastener Division, Talon, Inc.

"The Shu-Lok is a product of precision—yet it must be able to absorb the exceptional punishment of holding active boys' shoes intact indefinitely. Further, it is an assembly of small stampings. It is imperative from a production standpoint that we have the finest steel possible," says Carl M. Joslyn, plant manager of the Shu-Lok Fastener Division of Talon, Inc., shown above (left) with Shu-Lok sales manager David Dibbell.

"Rejected fasteners result not only in material loss, but an uncommon amount of assembly time is wasted. Precision, strength, consistent analysis—reasons why we use stainless steel and buy quality from *Sharon Steel Corporation, Sharon, Pa.*"

SHARONSTEEL

SHARON *Quality* **STEEL**

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Danny DoALL says:

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Call your local DoALL STORE!"

Experts specialize in guaranteeing new life for your usable Demon bands by reconditioning, resharpening and inspection . . . and their weld perfection assures 3½ times longer flex life. Also complete stocks of new blades.

THE DoALL COMPANY
DES PLAINES, ILLINOIS

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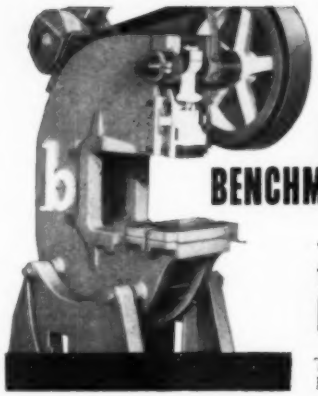

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. . . the small press that does BIG press jobs!

There's no matching Benchmaster variety and versatility. For example, Benchmaster makes *17 different press models with many variations of each* . . . in stroke length, shut height and throat depth.

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Grieder Tube Cut-Off Machines are 3 to 8 times faster than others, and speed is only one of the cost saving advantages they provide. For example:

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- $ Precision clamping dies prevent tube distortion and produce a quality cut. Tube does not rotate.
- $ Thousands of cuts without grinding. Blades can be sharpened on standard tool room equipment and used for as many as a million cuts.

Write for literature, stating tube sizes and production requirements.

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Please send bulletin describing Grieder Tube Cut-Off Machines.

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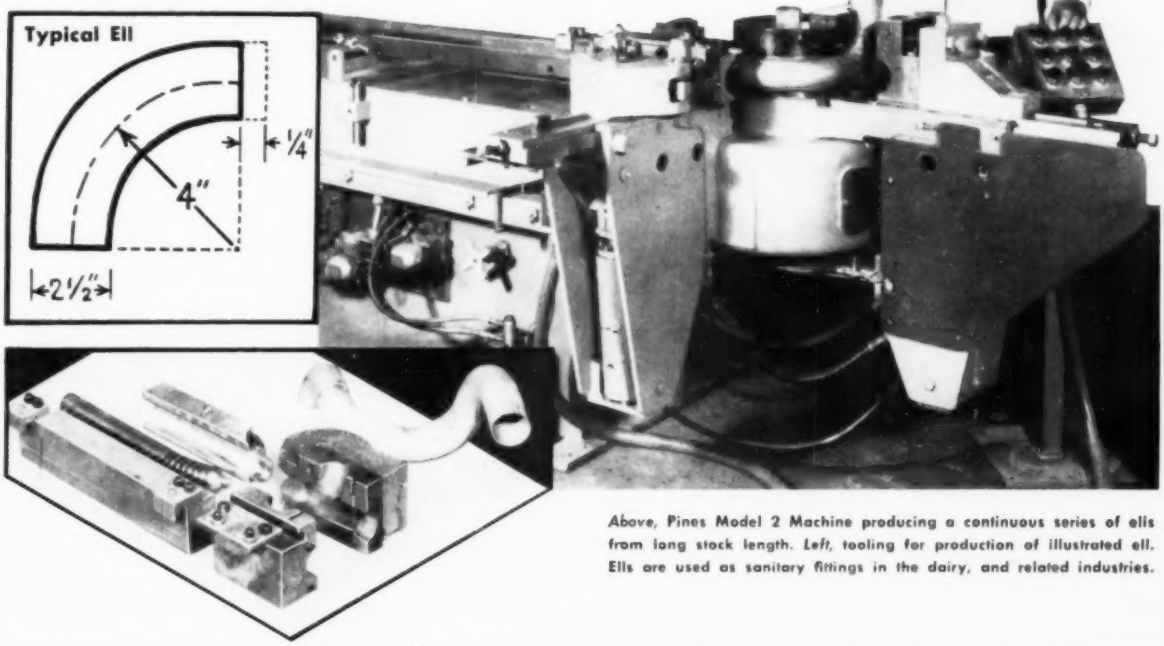
Production Up 400%
Scrap Reduced 87%

STAINLESS STEEL ELLS FORMED ON PINES MODEL 2 BENDER



Above, Pines Model 2 Machine producing a continuous series of ells from long stock length. *Left,* tooling for production of illustrated ell. Ells are used as sanitary fittings in the dairy, and related industries.

Here's another illustration of how cold bending the "Pines-Way" can increase output and reduce operating expenses. This Pines Model 2 Machine has enabled Alloy Products Corp., Waukesha, Wisconsin, to produce four times more stainless steel ells and cut scrap losses up to 87% over their previous method. Prior to installation of this machine, short lengths of tubing were filled with lead and bent on a press. From 2" to 3" were trimmed from each bend, and production was 30 ells an hour. Today, these bends in Type 304 stainless are produced in sizes from 1½" to 3" O.D., walls of .050" to .065", at an average of 125 an hour. Scrap loss through material trimmed away has been reduced to ¼" per finished piece.

Smooth, Small Radius Ells Produced in Continuous Series

Ells are produced as a continuous series of 90° bends in long stock lengths. All radii are less than 2x tube diameter. For example, 15 ells are bent in a 10 ft. length of 2½" O.D. tubing on a 4" centerline radius. Individual ells are saw cut from the spiral. Only 1/16" of the costly stainless, the width of the saw blade, is lost from each end.

Compound Tooling is Major Factor In Scrap Reduction

Quality, scratch-free bends are produced on tooling that includes compound bending and clamp dies, a mandrel, and a wiper die. A cleat in the horizontal groove of the bending and clamp dies reduces the stock length clamped for the first bend. Succeeding bends are made by clamping on the preceding bend. Call on Pines bending experience and tooling skill for the answers to *your* bending needs.

PINES ENGINEERING CO., INC.

Specialists in Tube Fabricating Machinery

672 WALNUT • AURORA, ILLINOIS

WRITE FOR *FREE* CASE STUDIES

For further case study reports on the cost-cutting advantages of cold bending, write for free copies of "Pines News." Catalog also available.

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CIRCLE 382 READER SERVICE CARD

How to estimate the time element in any machining job

Use this manual to make the winning but safe bids that mean more jobs and better profits for your shop.

Machine Shop Estimating

BY W. A. NORDHOFF
Douglas Aircraft Company, Inc.

408 pages, 486 illus., $8.00

Here's the kind of on-the-job help you need to make quick, reliable estimates of the time it takes to do the different machining operations in any machine shop, large or small. Whether a job involves drilling, boring, tapping, threading, grinding—or any of the scores of other operations—this handy manual tells you exactly what to consider in estimating job-time.

It covers every step—from setting up a job, to tearing it down—giving the specific time value established for each element. The various non-machining operations which enter into the cost of any job are also given. Instructions are provided for the use of several methods of estimating particular jbs on each type of machine in use today.

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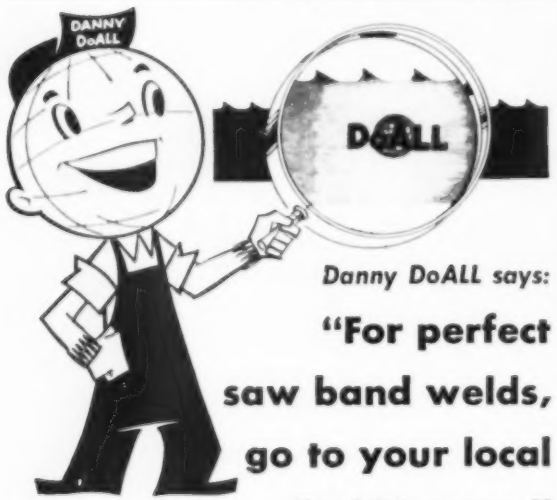

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THE DoALL COMPANY
DES PLAINES, ILLINOIS

Find Your DoALL STORE In The "Yellow Pages"

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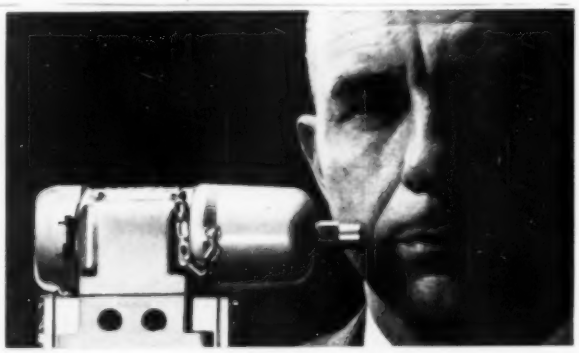

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ASSURE LONG TROUBLE-FREE OPERATION

In these 4-way valves there are no screws used to retain any of the valve parts. The valve body and solenoid cover utilize snap rings to complete an interlocking assembly *which can't work loose!* The MACsolenoid requires no fasteners whatever! Dual-Seal and companion line come in ¼" to 1¼" port sizes. Write for further information.

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MAC

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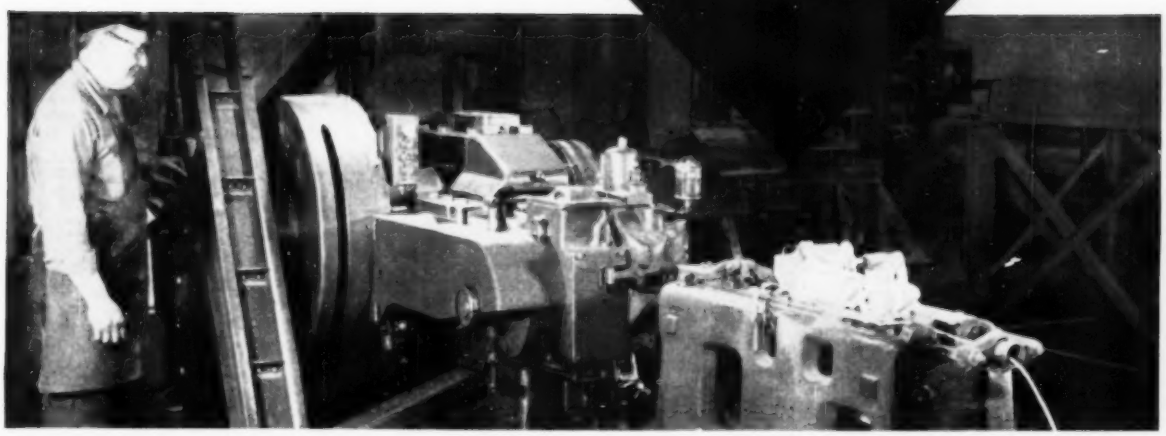
at work



You get good, predictable performance from a solid cold heading die only when the die steel you use is uniformly tough and strong through the core of the bar. But the core of the bar can only be as uniform as the core of the ingot it came from.

That's why *Carpenter* developed the MEL-TROL process. MEL-TROL uses the best quality control tools made, precise melting techniques, and an exclusive, patented ingot design, to turn out tool and die steels—such as H-9 Double Header for cold heading dies—that are more uniform through the center and have greater freedom from segregation and flaws than any other tool and die steels sold today. A call for H-9 Double Header to your nearest *Carpenter* representative—right now—is your very best answer to the problem of unpredictable performance in cold heading dies.

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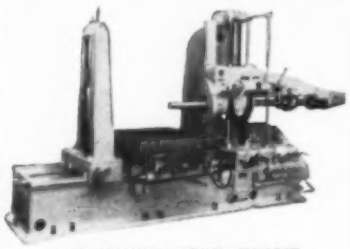

MODERNIZE YOUR PLANT
WITH MILES
REBUILT TOOLS

This 4 inch bar Universal Tri-Way horizontal boring, milling and drilling machine is typical of Miles PRECISION REBUILT MACHINERY. Rebuilt to new tool tolerances—with new metallic wearing plates installed. Immediate delivery. Price $28,500.

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DYNAMIC TINIUS OLSEN BALANCER, 16"x36", 1948
42A HEALD BOREMATIC, sngl. end, 1944, 3 hds.
2U SIMPLEX DOUBLE END BORER, 2 heads, 1942
DB1212 EXCELLO DOUBLE END BORER, late
BROACH, American, pull type, 18 ton 42" str.
BROACH, type XD-20-66 Oilgear, twin surface, late
4¼" CUTOFF, 4 spindle Conomatic
650 CFM SULLIVAN COMPRESSOR, angle compound, 125 HP
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TYPE A GEAR HOBBER, Barber Colman, 1944
NO. 2 CINCINNATI CENTERLESS, Filmatic, late
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72A3 HEALD INTERNAL, Gagematic and Sizematic, several
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4. Bending Machines
6. Boring Mills
7. Broaching Machines
8. Buffers & Polishers
11. Compressors
12. Cranes
16. Drilling & Reaming Machines
23. Gear Cutting Machines
24. Grinding Machines
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TITLE COMPANY

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6/15/59

Cimco

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Cincinnati Machinery COMPANY

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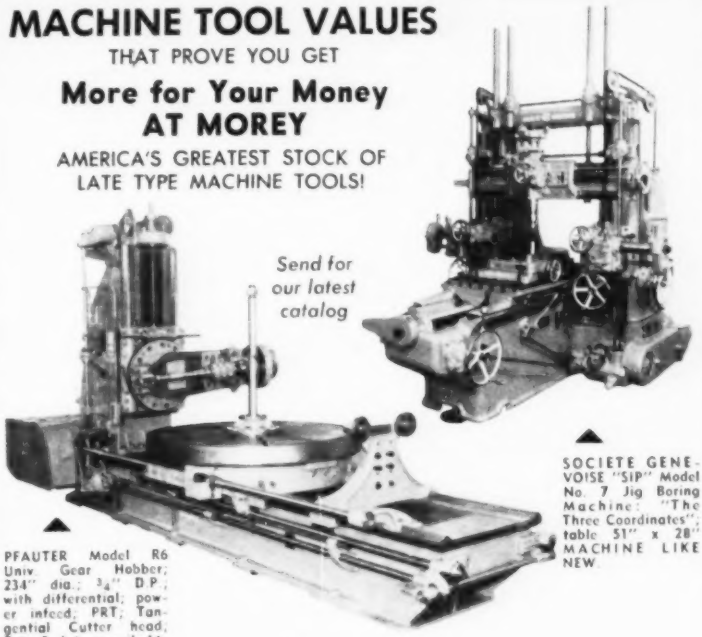

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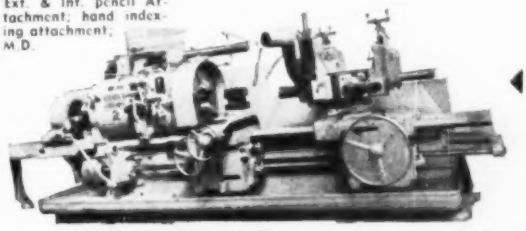
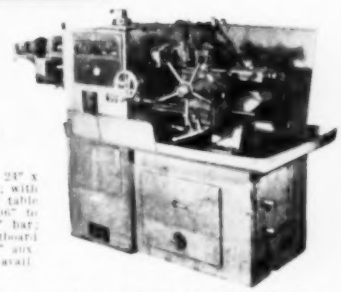


WARNER & SWASEY #4A Univ.; Saddle type. Model M1550; PRT; dia. hole through spindle 12"; M.D.; serial #541,316.



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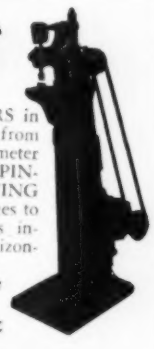


THE GRANT MFG. & MACHINE CO.
85 Silliman Ave, Bridgeport, Conn., U. S. A.

CIRCLE 388 READER SERVICE CARD

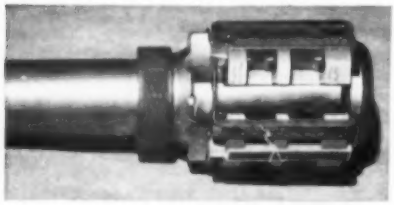
WHY MICROHONING* TOOLS ASSURE

ECONOMY—PRECISION—PRODUCTION

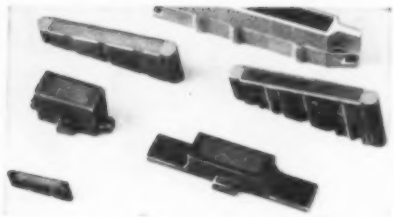
COST FACTORS (labor, maintenance, scrapped parts, productivity, etc.) DETERMINE MACHINE TOOL EFFICIENCY.

To Minimize These Cost Factors, Micromatic has developed Microhoning tools that offer a new concept in metalworking. This concept (known as the Microhoning process) assures controlled abrading, efficient stock removal, accurate generation of geometry and size, and produces uniform, functional surface finishes.

Because Microhoning removes inaccuracies of preceding operations, it is usually the final stock removal operation. Therefore, Microhoning tools are designed and applied to produce high precision, assure a minimum of scrap and protect the user's investment in previous processing operations.



New! Tru-Float tool has a universal joint within the abrading unit. This design provides maximum accuracy and float, uniform abrading and surface finish, less wear of abrasives, retention of original bore location, and minimum stock removal to correct inaccuracies.



Micromold assemblies have plastic or soft metal shells that minimize tool wear and protect the edges of abrasive sticks from the harsh dressing action of extremely rough bores. This abrasive stick design eliminates many parts previously required to hold abrasives and expand the tool.

Tool designed for Microhoning tandem bores has plastic guides between banks of abrasives to stabilize the tool as it passes over bore interruptions.

Because use of the proper tool is so important, Micromatic designs Microhoning tools to suit the individual work piece, and integrates tool design with machine and fixturing to provide the ultimate in operating efficiency.

*Registered U.S. Pat. Off.

MICROMATIC HONE CORP.

8100 SCHOOLCRAFT AVENUE • DETROIT 38 MICHIGAN

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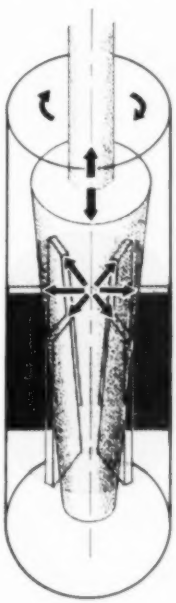
HOW MICROHONING* TOOLS PROVIDE

ECONOMY—PRECISION—PRODUCTION

When a precision stock removal process minimizes cost factors (labor, maintenance, scrapped parts, etc.) then volume production at lower cost per piece is possible. Here's how the distinctive design and performance of Microhoning tools provide all three—economy, precision and production.



EFFICIENT OPERATION

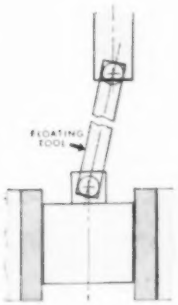
Micromatic expands, rotates and reciprocates the abrading tool in the bore. Through this controlled combination of pressure and movements, abrasives are self-dressing for effective and continuous cutting action. Long abrasive sticks are evenly spaced around the tool to keep it stable. They effectively bridge surface irregularities and generate a geometrically true cylinder.

REDUCES OPERATOR COSTS

Micromatic "Adjusting Heads" give operator complete and positive control of tool expansion. Or, automatic controls can be used to perform all tool adjustment and gaging. They assure accurate duplication in every part produced.

MINIMUM MAINTENANCE

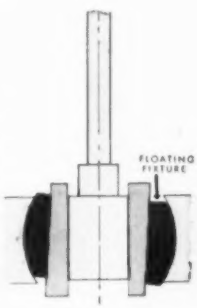
Micromatic tools are designed for durability, especially at all stress points and joints. Plastic or soft metal holders prolong abrasive life, greatly reduce tool wear.



MAINTAINS ORIGINAL BORE LOCATION

Micromatic either floats the tool or the work holding fixture so tool and work piece can automatically align themselves. This assures cutting-unit rotation coincides with neutral axis of bore.

WRITE FOR LITERATURE



Micromatic produces tools best suited to the production of individual work pieces. And properly integrates the tool with machine and fixturing for peak productivity at lowest cost per piece produced.

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The 1960 Buyers' Guide Issue of American Machinist—to be published in September, 1959—will include the biggest list of product sources ever. Over 3,400 manufacturers will list their products under 1,800 different headings. Meanwhile, when you need something refer to your 1959 Buyers' Guide. It's a tremendously valuable source.

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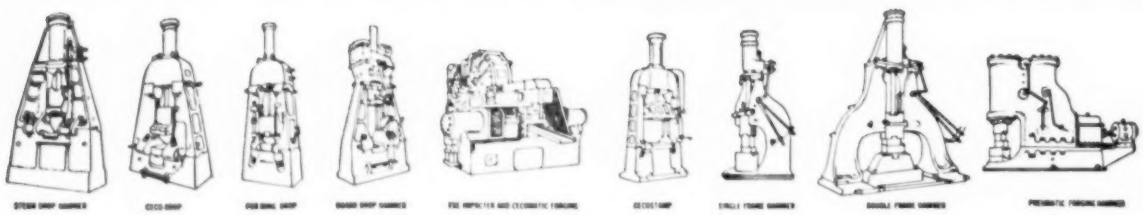

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